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Combined Power-lifting and Forcing Pumps.

In many localities, where ordinary pumps and necessary gear are employed to first raise and then distribute water, the whole machinery is multiplied, cumbersome, and costly; and the want of a compact, combined steam lift and force pump is apparent.

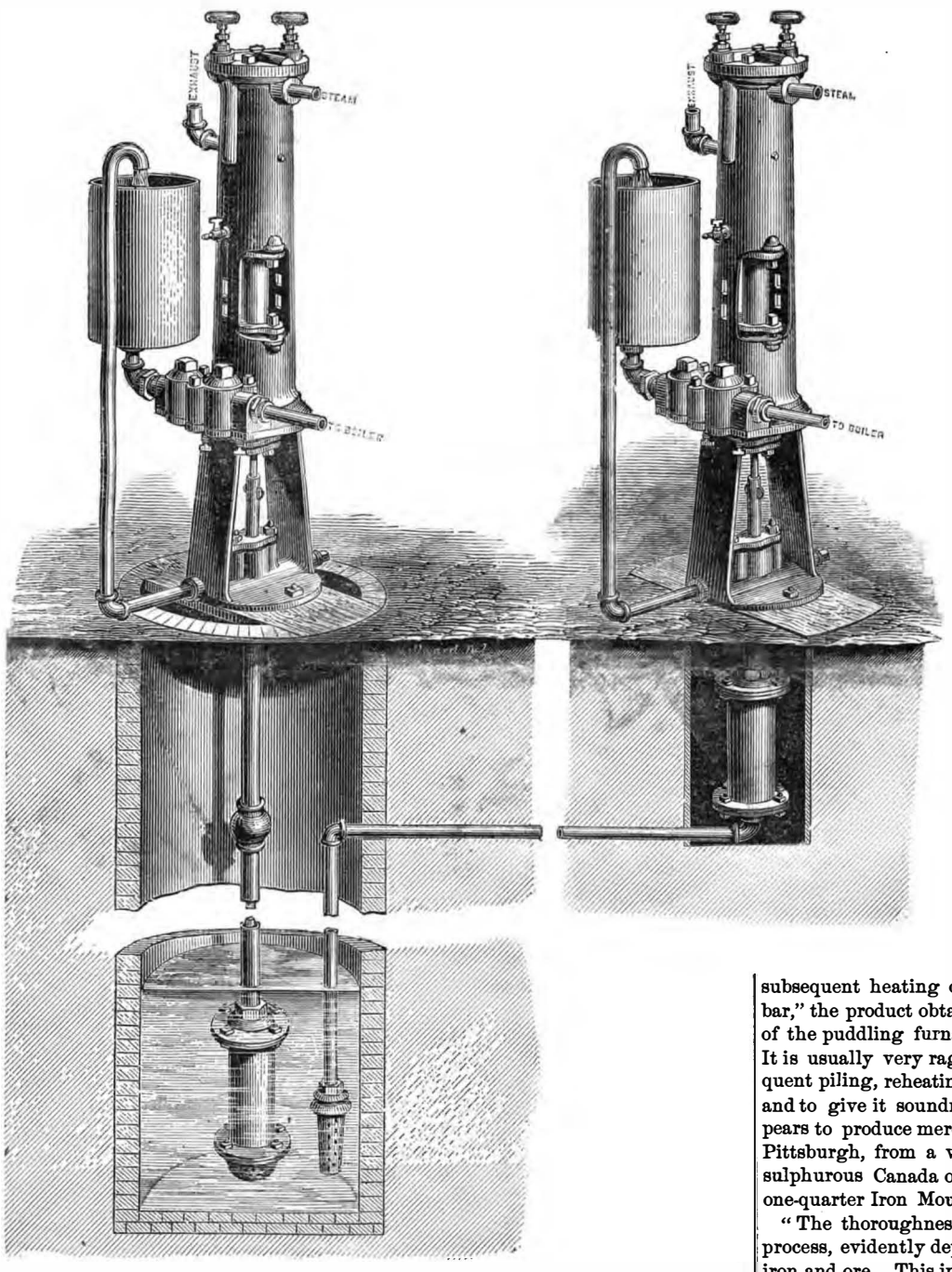
The engravings shown herewith represent two modifications of this useful combination—one a submerged pump, the other a pump with suction pipe leading in the desired direction to reach the well or source; each combination having for a motor a single steam cylinder with its piston and ram formed in one piece and provided with two separate throttle or regulating valves, to control the quantities or pressures of steam flowing through separate passages, to each end of the cylinder, suited to the character of the duty required. The ram is made to enter the force pump barred and has a reduced end passin through the bottom of the pump and stuffing box just below the channels leading to the valve box.

The engine and force pump cast and finished in one piece, is supported upon a cast frame with a base or channel plate, beneath which is attached a pipe in communication with the lateral channel formed therein; the connection of this pipe with the lift pump, forms a conduit for the same. The pump rod coupled to the protruding portion of the ram passes down through the conduit pipe and is guided truly within the pipe, when length requires it, by one or more ingeniously formed pipe couplings which have water-ways around a central core or diaphragm, which core is bored out to fit and guide the rod in its movements connected to the working parts of the lift pump.

When desired to operate, steam is admitted and regulated on its way, accordingly as is the depth at which the lift pump is placed, to one end of the steam cylinder, and the force of the resistance to be overcome to the other end of the cylinder, until the desired regularity of reciprocation is attained. The water is then made to flow from the well or scource up through the conduit pipe and lateral channel and pipes to the tank or heater. From the tank or heater the water is supplied at any temperature to the force pump, which delivers it into the boiler or other vessel, under pressure either from steam or hight of column.

It is obvious that the duty of either pump can be increased or lessened, or either pump can be worked separately, by withholding the supply of water from the force pump, in the one case, or by withdrawing the coupling key which connects the lift pump rod, in the other case.

The pumps shown in the engravings are single acting, but double acting ones are substituted, as required. For further information address Cope & Co., manufacturers, No. 118 East Second street, Cincinnati, Ohio.



COPE & MAXWELL'S STEAM, LIFT AND FORCE PUMPS.

THE ELLERSHAUSEN PROCESS OF MANUFACTURING IRON.

We recently noticed the fact that a new process of manufacturing iron was on its trial at Pittsburgh. This process we stated consisted in obviating the necessity of puddling, by mixing pulverized ore with the crude metal as it runs from the smelting furnace. The process is conducted at the works of Messrs. Shoenberger at the above city, and is the invention of Mr. Ellershausen. We alluded to the fact that we had obtained and tested specimens of the iron thus produced and found them of fair quality though slightly red-short, and promised to give the details of the process as soon as they could be obtained. The following is a description of this new method, extracted from *The New York Times:*

"The process consists in the conversion of crude cast iron, as it runs from the smelting furnace, into wrought iron, by the simple admixture of granulated iron ore. It is carried out at the works of Messrs. Shoenberger, at Pittsburgh, in the following manner: On the casting-floor of the smelting furnace, a cast-iron turn-table, about eighteen feet in diameter, is revolved on rollers by a small steam engine. Upon the outside edge of the table stand a row of cast iron partitions, forming boxes, say twenty inches wide and ten inches high, open at the top. Just above the circle of boxes stands a stationary, wide-mouthed spout, terminating in the tap hole of the furnace. When the furnace is tapped the liquid iron runs down this spout, and falls out of it in a thin stream into the boxes as they slowly revolve under it, depositing in each a film of iron say one-eighth of an inch thick. But before the fall of melted iron reaches the boxes it is intercepted, or rather crossed, at right angles, by a thin fall of pulverized iron ore, which also runs out of a wide spout from a reservoir above. These two streams or falls are of about equal volume, say one-quarter of an inch deep and twenty inches wide. A workman, with a bar in the tap hole, regulates the stream of iron, and the iron spout from which the liquid metal falls into the boxes is removable; other spouts, previously coated with loam and dried, being attached to a common revolving frame, so as to be ready for use when the loam covering of the first becomes cracked or removed.

"The thin layers of iron and ore soon chill and solidify, so that by taking away the outer partition of the boxes (which form the rim of the turn-table) they may be removed in cakes of the size of the boxes, and weighing about two hundred pounds each. Four of these cakes or blooms are put into a reverberatory puddling or heating furnace, and raised to a bright yellow heat. They will not melt at this heat, but become softened so as to be easily broken up with a bar. The four blooms are formed, in the furnace, by the "rabble" of the workman, as in ordinary puddling operations, into eight balls. The balls are brought out, one after another, squeezed in the ordinary "squeezers" to expel the cinder and superfluous ore, and then rolled into wrought-iron bars, which are now ready for market, or for further reduction into smaller finished forms.

"The chemistry of the operation is as follows: The crude cast iron contains say five per cent of carbon and two per cent of silicon, and more or less sulphur, phosphorus, and other impurities. In the Bessemer process, the oxygen of the air, blown into the liquid iron, combines with this carbon and these other impurities, and not only removes them, but leaves the pure iron in a liquid state, from which it can be cast into homogeneous masses of any size. In the puddling process, the oxygen of the air and of the ore or other "fettling" put into the furnace with the iron, combines with and eliminates the impurities, which are afterward squeezed out of the pasty mass by the squeezers and rolls. This process is long and comparatively expensive, because the mixture of oxygen or oxygen-bearing substances is not made intimate with the iron except by long stirring, which is not only skillful, but exhausting work.

"In the Ellershausen process the oxygen of the ore or oxide of iron (magnetic oxide is preferred) combines with the carbon and impurities, eliminating them as in the puddling process, and the iron of the ore increases the product. The chemical combination of the ore and the liquid crude iron appears to take place partly at the time of their contact when falling and lying upon the turn-table, and partly where the reheating occurs in the furnace. It seems impossible that a reaction which is so violent in the Bessemer process, and so prolonged in puddling, should take place so quickly and quietly in the new process, but the fact that the cakes of iron and ore do not melt by subsequent heating, as cast iron would prove that its nature is changed by the first contact of the ore. The removal of sulphur and of phosphorus also seems more thorough than in the other processes. Analyses at different stages of the operation will throw more light on this question.

"The remarkable feature of the Ellershausen process is that absolutely no skill is required to carry it out. The proportion of ore mixed is intended to be about thirty per cent, but if too much is added, it is readily squeezed out with the slag, and seems to do no harm. The subsequent heating occupies about half an hour. "Puddle bar," the product obtained from the first rolling of the product of the puddling furnace is never marketable or finished iron. It is usually very ragged and unsound, and requires subsequent piling, reheating, and rerolling, to expel the impurities, and to give it soundness and solidity. The new process appears to produce merchantable iron at the first rolling, and at Pittsburgh, from a very inferior pig iron, made of one-half sulphurous Canada ores, and one-quarter Lake Superior and one-quarter Iron Mountain ores.

"The thoroughness and rapidity of the purification by this process, evidently depend on the intimacy of the mixture of iron and ore. This intimate mixture is also the essence of the Bessemer process. In fact, to Mr. Bessemer's original apprehension of this idea of intimate mechanical mixture, the greatest modern improvements in the iron manufactures are due."

The saving in coal was stated to us as averaging about six dollars per ton. The *Times*, from which the above was taken, states that it will amount to from ten to thirty dollars per tun, according to the materials used and the form of product required. We do not believe such a saving can be made, but events may prove us in error upon this point. As to the production of merchantable iron at first rolling, the article above quoted from is calculated to mislead, unless a great improvement has been made since we were at Pittsburgh a few months since. At that time the iron, although not puddled, was rolled more than iron usually is by the old method, although it was done at a single heat. The principles upon which the Ellersshausen process is based are undoubtedly sound, but we are inclined to wait for further developments before admitting as much as is claimed for it.

Steel for Gravers.

A correspondent writes us that he finds difficulty in getting steel sufficiently hard and tough to stand, without leaving the graver too large at the cutting point. The tools referred to are used for the graduation of squares. He suggests that the steel described recently in our paper, entitled "New Steel," would be useful for this purpose. This steel has not, so far as we can ascertain, been introduced into this country yet. If it has, parties interested would do well to advertise it in our

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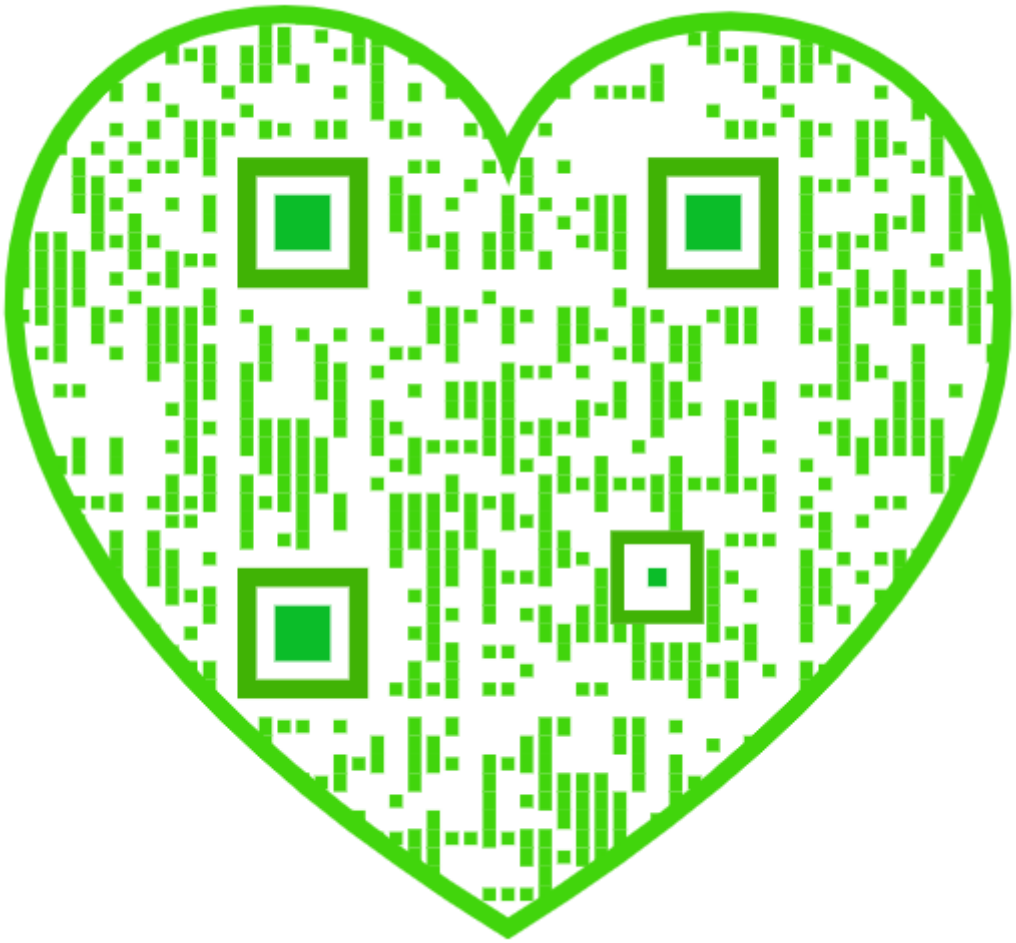

columns. We are in receipt of inquiries about it which we cannot answer.

HOW COMMON WINDOW GLASS IS MADE.

A pane of glass is not a complicated structure. Were an inventor however called upon to devise a method of making window glass, having no previous acquaintance with the subject, the method in use would seem to be the very last he would be likely to hit upon. It is usual to speak of common window glass as being blown. To one unacquainted with the mode of its manufacture, the term blown, conveys a very imperfect idea of it. It is true that blowing is a large and important part of the operation, but it would be impossible to produce a flat pane of glass by blowing alone.

There are three ways in which flat tables or plates of glass may be obtained, one of which does not involve blowing at all. Glass made by the latter process is called plate glass. The glasses made by the two systems which require blowing are called respectively "crown glass" and "cylinder glass," terms derived from peculiarities in the methods of producing them. We shall first describe the method of producing

CROWN GLASS.

The arrangement of the furnaces for manufacturing glass has already been described in an article entitled "Glass Blowing," published on page 90, current volume. The workman takes up on the end of his pipe a large mass of glass by successive operations exactly as described in the article referred to, except that for making crown glass, he takes up a much larger weight. He also rolls it upon the "marver" in the same manner as he would for making bottles; but in the present operation greater care is required to prevent the occurence of inequalities, as the mass of plastic glass is so much larger. Having formed the ball upon the marver until it assumes the shape of a pear, an assistant—generally a boy—meanwhile slightly distending it by blowing, it is next softened in a small furnace and again rolled on the marver to correct any inequalities that may have formed during the last heating, and at the same time to collect the greatest mass of glass at the extreme end technically called the "bullion." The bulb is now further extended by a blast from the lungs of the workman, it being meanwhile supported by resting the pipe upon a horizontal bar called the "bullion bar," until it assumes nearly the form of a sphere. In some instances the "bullion bar" is dispensed with, other equivalent apparatus being substituted for it. Its use is to aid the workman in rotating the bulb, so as to keep it as nearly as may be to the globular shape.

It is next taken to the bottoming hole. This is a circular hole in a furnace before which, at a short distance, is built up a screen of mason work which extends far enough to protect the workman from the heat. His face is also protected by a mask, having apertures with glass plates to permit his seeing his work. The pipe with its expanded bulb is laid across a hook projecting from the screen of mason work. Here the bottom of the bulb (bullion) is exposed directly to a high heat and the pipe being rapidly rotated by the workman, the centrifugal force thus generated soon reduces the bulb from the form of a globe to that of a prolate spheroid, that is, it spreads laterally until the side opposite the fire becomes nearly flat. An assistant now attaches to the center of the side opposite the pipe, an iron rod called a "pontil" or "punty" so that it shall stand as nearly as possible in the axis of rotation. The first workman then immediately detaches the pipe by touching the neck of hot glass with a cold iron wetted with water. The side to which the pipe has hitherto been attached is now presented to the furnace. Rotation being continued the glass begins to expand, the hole left by the detachment of the pipe becoming larger and larger until finally the whole bulb suddenly expands into a single flat table. Before this result is attained however, it becomes necessary to remove the bulb to a large furnace called the "flashing furnace," which has an opening similar to the "bottoming hole," except that it is larger. The glass has now the form of a flat circular plate, but at the point where the punty is attached there will be left upon it a projection called the "bull's eye." In order that the form of the plate may not be altered rotation is kept up until the glass is sufficiently cool to support itself. It is then taken upon a large iron fork by another assistant and the punty being cracked off, the plate is carried to the annealing furnace where it remains twenty-four hours. After the annealing the glass may be cut into proper sizes and packed.

The above outline gives but a faint idea of the skill required to produce crown glass. Necessarily a description of all the minor manipulations requiring the greatest dexterity have been omitted. Enough however has been said to give the reader correct ideas of the general principles of the method. Crown glass is not manufactured now in this country or in Europe, as extensively as

CYLINDER GLASS.

In the manufacture of cylinder glass the blowing extends only so far as to produce a cylinder open at both ends. In fact the blowing is during the entire process accompanied by manipulations of a peculiar character; blowing alone would not produce the desired result. The furnace holes are somewhat elevated, and platforms extend out from the base of the furnace, one for each hole or pot, upon which the workman stand. These platforms are of considerable length, and have pits of considerable depth dug between them to permit the workmen to swing the bulb during the process of elongation. The manipulations are the same as for crown glass up to the point where the globe is expanded, and have so far been already described. When the blast is first forced into the plastic glass, the expansion takes place in that portion of the pear-shaped mass called the neck. The workman now holds the ball over his head, and the weight of the thick portion of the mass presses down the expanded portion until it assumes the shape of the top of a bottle like the large ones used by druggists to contain their tinctures, etc. The expanded portion being now permitted to cool, which it does readily on account of its thinness, becomes rigid. The workman then commences a complex manipulation. He blows through the pipe at the same time he rotates it to keep up the cylindrical form of the expanding portion, and also swings the ball in one of the pits above described, thus elongating the cylinder. The glass as it becomes thin cools off and becomes rigid, and one of the most difficult parts of the operation consists in expanding the glass to the required size at precisely the time when it becomes so cool as to remain in the proper form. When the walls of the cylinder have become everywhere of uniform thickness, and the proper length has been attained, the end farthest from the pipe being closed has a hemispherical form. This end is now subjected to a quick heat at the mouth of the furnace, and burst open by a strong blast through the pipe; the pipe being now rotated the part thus burst open is expanded by centrifugal force to the size of the cooler parts of the cylinder. The cylinder is now laid in a frame and the pipe detached. The end from which the pipe has been separated has now the form of the upper part of a druggist's bottle. This portion has therefore to be removed. To effect this the workman takes from the furnace, with small iron rods, a small wad of plastic glass and separating the two rods draws out the glass into a red-hot plastic cord which he winds about the cylinder just where it begins to contract towards the neck. The cylinder being thus heated entirely about, cracks off in the direction of the heated line, upon being touched with cold water. The cylinder has now to be opened. This is accomplished by placing a bar of hot iron longitudinally along the side of the cylinder; when sudden cooling cracks it from end to end. It is now passed to the annealing furnace and flattening kiln. The construction of this furnace is peculiar. It consists of a vault in which revolves an iron frame supporting platforms, called flattening stones. Openings are placed around this furnace at which workmen stand. A cylinder of glass is laid in at the first opening, the cracked side upward, and allowed to heat until it becomes plastic. As soon as this takes place the workmen by means of a winch revolves the platform and puts in a second cylinder. The partial revolution brings the heated cylinder opposite the next opening, where a workman spreads it out with an instrument consisting of a block of wood upon an iron handle. By this time another cylinder is ready and the platforms again revolve. The first cylinder—no longer a cylinder, but a plate— is now operated upon by a third workman who smooths it out with a tool similar to the one above described. The glass is then passed through several chambers having gradually diminishing temperatures until it is sufficiently annealed. It is then cut into panes, and packed for sale.

No verbal description can give an idea of the facility with which these operations go forward, or the skill required to accomplish such results by the simple methods employed.

The labor is severe, and, commands wages equal, if not superior to any manual labor performed. Some of the cylinders blown are very large, being from four to five feet in length, and from twelve to fourteen inches in diameter. The process is one of the most interesting to witness in the whole range of mechanical operations, and will well repay some extra trouble and time to those who may never have seen it performed, should chance bring them in the vicinity of a glass manufactory.

INVENTOR OF STEREOTYPING.--WILLIAM GED.

Few readers of the *Ledger*, I presume, have ever seen or heard the name placed at the head of this article. Nevertheless it was the name of a man who conferred a favor upon them all; since he invented the art without which it would be impossible to sell a copy of the *Ledger* at its present price. William Ged was the inventor of stereotyping.

He was a Scotchman, born about the year 1690. For some years he was a thriving goldsmith at Edinburgh, and was considerably noted in the trade for his ingenuity. He invented some tools and processes which facilitated the exercise of his craft, and these he freely made known to persons of the same vocation. It appears that his attention was called to the art of printing by his being employed in paying off the hands of an Edinburgh printing-house, which led him to reflect upon the vast amount of labor absorbed in the production of a book. In those days, a goldsmith performed some of the functions of a banker, and kept other people's gold in his strong box as well as his own. It was probably in his capacity as a banker that he furnished the money for the payment of the Scottish printers.

It is a curious circumstance that as late as the year 1725, no types were cast in Scotland, although the business of printing had then attained considerable proportions in that country. It seems, too, that the English printers then imported some of their best type from the continent. Young Benjamin Franklin, in that very year, worked as a journeyman printer in London, and he tells us that his master employed fifty men; but notwithstanding this large demand for types, the English printers imported some kinds from Holland, a country which appears to have had in ancient times almost a monopoly of the business of type-founding.

One day in 1725, William Ged fell into conversation with a printer who spoke of the loss it was to Scotland not to have a type-founder nearer than London. The printer showed the ingenious goldsmith some single types, and also composed pages standing ready for the press, and asked him if there was anything so difficult in the manufacture of type that he could not invent a way of doing it.

"I judge it more practicable," replied the goldsmith, "for me to make plates from the composed pages than to make single types."

"If," said the printer, "such a thing could be done, an estate might be made by it."

William Ged requested the printer to lend him a page of composed type for an experiment, which he took home with him and proceeded to consider. After several days of experimenting, he appears to have hit upon the right idea. That is to say, he came to the conclusion that the composed page must be cast; but the question remained, what was the proper material in which to cast it; and it was not until two years had elapsed that he discovered the secret. He appears to have tried the harder and more expensive metals before attempting it in a metal or compound of metals similar to that of the type itself. At the end of two years, he had such success that no one could distinguish an impression taken from one of his cast plates from ordinary print.

From this time, he had the usual experience of an inventor. Although not destitute of capital, he offered a fourth interest in his invention to an Edinburgh printer, on condition of his advancing all the money requisite for establishing a stereotype foundery. But this printer, upon conversing with others of the craft, became so alarmed at the expensiveness of the undertaking that he failed to perform his part of the contract. The partnership lasted two years, during which the cautious Scotch printer advanced but twenty-two pounds; and the impatient Ged looked eagerly about him for a more enterprising partner. Thus four years passed away after he had begun to experiment.

A London stationer, William Fenner by name, being by accident at Edinburgh, heard of the invention, and made an offer for a share in its profits. He agreed to advance all the money requisite; and, four months after date, to have a house and materials ready in London suitable for Ged's purpose. The inventor thought it a hard bargain to relinquish one-half the profits of so valuable and costly a conception; but he gladly accepted it, and proceeded to arrange his business for a removal to the metropolis.

Arriving in London at the time appointed, he was sorely disappointed to find that neither house nor material was ready for him. His delinquent partner, who was a plausible fellow, contrived to satisfy him with his excuses, and even induced him to admit into the firm a type-founder on condition of his supplying them with the requisite amount of type. This tpye-founder, however, furnished them only with refuse type, wholly unsuited to the purpose, which Ged rejected, to the great disgust of both his partners. Not discouraged, he next applied to the king's printers to know if they would take from him stereotyped plates of a certain excellent type which they had recently introduced. A day was appointed for Ged to lay before them in detail his plans and proposals.

Before the day named for the interview, the king's printers very naturally consulted upon the subject the very type-founder who had furnished them with the admirable type which had attracted Ged's attention. The type-founder as naturally pooh-poohed the new system; indeed, laughed it to scorn, and said he would give the inventor fifty guineas if, in six months, he would make one page of the Bible by the new method, which would produce as good an impression as could be obtained from good type. The interview, however, occurred, and probably Ged would have convinced the king's printers of the feasibility of his plans, but for the adverse opinion of an interested man. The printers told the inventor of the offer of fifty guineas, and said that the gentleman who made it was then in the house:

"Being called into our company," Mr. Ged relates, in a narrative dictated on his death-bed, after a long life of disappointment, "he bragged much of his great skill and knowledge in all the parts of mechanism, and particularly vaunted that he and hundreds beside himself could make plates to as great perfection as I could; which occasioned some heat in our conversation."

The dispute was settled at last by a kind of wager. The type-founder and Ged were each of them to be furnished with a page of the Bible in type, and bring back within eight days a stereotyped plate of the same; and he who failed was to treat the whole company. An umpire was appointed—the foreman of the king's printing house—and the parties separated. The result may best be given in Ged's own quaint language:

"Next day about dinner time, each of us had a page sent us. I immediately after fell to work, and by five o' th' clock that same afternoon, I had finished three plates from that page, and caused to take impressions from them on paper, which I and partners carried directly to the king's printing house and showed them to said Mr. Gibb, the foreman, who would not believe but these impressions were taken from the type; whereupon, I produced one of the plates, which, he said, was the types soldered together, and sawed through. To convince him of his mistake, I took that plate from him, and broke it before his face, then showed him another, which made him cry out. He was surprised at my performance, and then called us to a bottle of wine; when he purposed I should take eleven pages more, to make up a form, that he might see how it answered the sheet-way."

Poor Ged had been only too successful; for the printers fancied they saw in this new invention the destruction of their business; and from this time, there appears to have been a tacit understanding among them that Ged and his scheme were to be frustrated. At the expiration of the eight days, the type-founder failed to keep his appointment, but had the honesty to send word that he could not perform the thing himself, neither "could he get one of the hundreds he had spoken of to undertake it."

The news of Ged's invention circulated in London, and specimens of his plates were handed about, till one of them fell

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into the hands of the Earl of Macclesfield. This nobleman caused the partners to be informed, that the office of printer to the University of Cambridge was vacant, and that the heads of the University would be glad to receive them, and award them the privilege of printing Bibles and Prayer Books by the new process. This was joyful intelligence; but the too easy and credulous Ged was not the man to profit by it. Indeed, the opposition of the London printers was so general and so violent, that a stronger man than he might have struggled against it in vain. He now discovered that his partner, Fenner, was not possessed of capital, and they were obliged to admit a fourth partner, who afterwards boasted that he had joined the company for the sole purpose of destroying it.

"As long as I am their letter-founder," said he to a leading printer, "they shall never hurt the trade, and it was for that reason I joined them."

The contract, however, was obtained from the University, and Ged went to Cambridge to superintend the work. But he was utterly unable to contend against the opposition of the printers; and the less, because he had not been bred a printer himself. His partners deceived and cheated him; his colleague, the type-founder, sent him damaged and imperfect type. He sent to Holland for a supply. After two months they arrived, but they proved to be so incomplete that an impression taken from them was little more than a page of blots.

After struggling with difficulties of this nature for four or five years without being able to complete the stereotyped plates for one Bible or Prayer Book, his patience was exhausted and he returned to Edinburgh, a ruined man. The true cause of his failure was his extreme credulity, which was such as to disqualify him from successfully dealing with men. At Edinburgh his friends, anxious that so valuable an invention should not be lost, made a subscription to defray the expense of stereotyping one volume, and Ged apprenticed his son to a printer in order that he might not be dependent for the necessary assistance upon a hostile body. By the aid of his son, he completed plates for a Latin Sallust, which was printed in the year 1736, and copies of it are still preserved in Scotland as curiosities. As he was unable to procure the best tpye, this Sallust is not a very fine specimen of stereotyping; but it is a convincing proof that William Ged had mastered the chief difficulties of the art, and that in more favorable circumstances he could have executed work which even at the present day would be considered creditable.

The invention was never a source of profit to the inventor. By the time his son was a sufficiently good compositor to render him valuable aid, and just as they were to embark in business together, he was taken sick. He died in 1749.

It is a proof of the simplicity of his character and of his faith in the value of his invention, that, though he had offers from Holland either to go thither or sell his invention to Holland printers, he always refused.

"I want," said he, "to serve my own country, and not to hurt it, as I must have done by enabling them to undersell by that advantage."

After Ged's death, the secret slumbered till about the year 1795, when it was revived or rediscovered in Paris, and soon after brought to considerable perfection in England. At present the art of stereotyping has been brought to the point, that our daily newspapers, such as the *Times*, *Herald*, and *Tribune*, containing eight large pages, are stereotyped every night in from twenty to thirty-five minutes, and as many copies of the plates can be produced as may be desired.—*New York Ledger.*

THE THERAPEUTICS OF WAKEFULNESS.

Prof. William A. Hammond, M. D., communicates the following article on wakefulness to the Detroit *Review of Medicine and Pharmacy*:

Brushing the hair, or friction of the skin, as by rubbing the palms of the hands or the backs of the arms, will in some persons tend to induce sleep. Soothing sounds have sometimes a similar effect. On the other hand, persons whose occupations are noisy are apt to awake when the noise to which they are accustomed suddenly ceases. A miller has been known to wake up when the noise of the machinery stopped, and a man who had for many years lived within sound of the roaring of Niagara Falls, was unable to sleep at first on removing from the locality.

But agents more efficacious than such external ones, are those which lessen the amount of blood circulating in the brain. First may be mentioned food and drink, of whose happy influence a frequent illustration is given in the case of a late supper. During digestion more blood circulates through the gastro-intestinal vessels than when the abdominal organs are unemployed; and this additional amount of blood must come from some other part of the body, since a marked excess of this fluid cannot exist in two different parts at the same time, except in cases of disease. That the amount of blood in the brain is diminished during digestion is evinced by the feeling of drowsiness commonly experienced, which is a perfectly healthy sensation. The food, thus taken as a therapeutic agent, should be easily digestible. The sensible physician will hardly resort to drugs, if such pleasant medicine as a good supper can be given with equally good effect.

In persons weak or anemic, especially women who have been rendered so by hemorrhages, a dose of some one of the various preparations of alcohol at bed time is frequently advisable. Of these, wines are not generally so admissible as the stronger preparations, such as spirits; in this country whisky will be most easily attainable. A Methodist clergyman, who came under my care, had been unable, for seven or eight weeks, to sleep more than two hours each night. I prescribed a dose of whisky to be taken at bedtime. He at first strongly protested against taking it, upon grounds of principle and his previous habits of total abstinence, but finally agreed to try the remedy. The first night he slept five or six hours, the second seven or eight hours; his whisky was then reduced in amount gradually, from half a glassful to none at all. He continued to sleep well, and had not formed any habit of drinking.

In healthy persons coffee is calculated to produce wakefulness; in others it acts as a hypnotic, much as other stimulants do in asthenic cases. For the latter purpose, do not trifle with it by administering a little of a weak infusion, but give strong doses at once. Much depends upon the method of making it. Exhaust the strength of three or four ounces of ground coffee by percolation, with a rather small amount of boiling water; and give without milk or cream. Tea is not to be compared with coffee as a therapeutic agent, in this connection. It acts in a similar manner, but not so efficiently.

Sometimes sleep may be produced by physical exercise taken regularly about two hours before bedtime This acts best in sthenic cases. It has been often noticed that change of air and carriage exercise produce sleep. The *modus operandi* of this I cannot explain, any more than the familiar fact that the rocking of a cradle puts an infant to sleep.

Some time ago, in England, there was constructed a table, known as Darwin's table, for the purpose of producing sleep in the insane. It was circular, and rotated upon a screw at the center. On this the patient was placed, with his head at the center, and the table was turned, thus producing sleep according to correct physiological principles, although these principles were not then known.

The warm bath may be used as a hypnotic. In employing it, the head should be prevented from becoming heated, as by putting cold water upon it while the body is immersed; the application of cold water is, however, rarely necessary in the case of infants. The temperature of the bath is best regulated by the hand. Sometimes cold water alone applied to the head proves sufficient, without the warm bath. I remember having read somewhere in Graves' writings that the Indian women sometimes put their babies to sleep by giving their heads a cold douche; this was also applied in the British army at one time as a punishment, and, it was found, with the almost invariable effect of producing sleep.

Another remedy, often of much value, is the application of a sinapism to the epigastrium. How it acts I do not know; it cannot well do so through the circulatory system, but may by impression upon the nervous system. The position of the body is important. In many cases, holding the head down produces wakefulness; such persons should, in case of wakefulness, go to sleep in the erect position.

Certain drugs form another class of agents for the production of sleep. That which has been longest in use is opium. As regards its power of bringing on sleep, the dose of opium varies in different patients. In small doses of half a grain to three-fourths, as an average, it acts as a stimulant; in moderate doses of one or two grains, it is hypnotic; and in larger ones it produces stupor, and not true sleep. Narceine, one of its constituents, has been found to produce profound and continuous sleep, but the ordinary preparations of it are too uncertain to be relied upon, and it is too expensive for frequent use.

Hyoscyamus sometimes acts excellently; it has the advantage over opium of not producing headache and constipation the following day. The tincture, especially Neergaard's, may be given in doses of a drachm to a drachm and a-half three times a day, if necessary.

Oxide of zinc may prove serviceable in some cases. It came into use in the treatment of the nervous condition preceding delirium tremens. It has also been of value in hysteria when everything else had failed. Its dose is, as a maximum, two grains three times a day; as much as four grains may be given at the same intervals, but this quantity will generally produce irritability of the stomach.

Phosphorus is a remedy which has come into use more recently, in the class of cases of which we are speaking. It is supposed to act by supplying a deficiency in the elements of nervous tissue, increasing the amount of protagon. Owing to its chemical properties, it is not easily administered. It can be given in the form of phosphorated olive oil, in the proportion of four grains to the ounce. It is preferable, however, to boil twelve grains of phosphorus in one ounce of almond oil, and filter. The oil absorbs four grains of phosphorus, so that each minim contains $\frac{1}{120}$ of a grain. Half an ounce of the oil is now mixed with an ounce of gum-arabic, and fifteen drops of some aromatic oil are added. Of this mixture the dose is fifteen drops, equal to five drops of the phosphorated oil, and containing $\frac{1}{24}$ of a grain of phosphorus.

I have used this remedy in eight cases with success, and failed in two cases. I try to get three doses taken before bedtime, and thus far have generally succeeded in producing the desired effect on the second day, if I had not on the first. The dose may be increased a drop a day, till twenty drops are taken, or signs of gastric irritation supervene. I would not advise giving it in larger doses. In one of my cases, nausea was produced on reaching twenty drops, but sleep ensued also.

But of all the sleep-producing agents at our disposal, the bromide of potassium is most deserving the name of hypnotic. I have never seen it fail when given in sufficient quantity. A healthy adult may take from twenty to thirty grains three times a day; the latter dose is not too large when it is needed at all. Sometimes it produces, among its other effects, great weakness in the legs, and a staggering gait, strongly resembling that of a person intoxicated with alcohol. In fact, I know of a gentleman who, while under the influence of this drug, was twice arrested in our streets for drunkenness. Bromide of potassium occasionally produces also a great lowness of spirits, and a disposition to cry. It should be administered very much diluted. It may be conveniently prescribed in one ounce to four ounces of water; a drachm dose of this to be given in at least half a tumblerful of water.

A remedy which I have used recently, especially in cases of nervous excitement where a sedative seemed indicated, is sumbul. This is a plant of the same family as valerian. I have used it in conjunction with bromide of potassium in epilepsy, with the result, as I think, of increasing the effect of the latter. The dose of the fluid extract (Neergaard's) is from twenty drops to a drachm three times a day.

LECTURE ON THE SPECTROSCOPE.

The last lecture but one of the series of admirable scientific expositions before the American Institute, was delivered last evening in Steinway Hall, by Professor Cook, of Harvard University, on the "Spectroscope." The hall was densely crowded.

The Professor said: The color of light depends, to a certain limited extent, on the nature of the source from whence it proceeds, and by a study of the relation between these two we have reached a new method of chemical analysis, by which we have been enabled, not only to discover several new metallic elements among the materials of the globe, but also to extend our investigations beyond the limits of our globe, and to reach some knowledge, however indistinct as yet, respecting the sun, the planets, and the other heavenly bodies. To the course of reasoning through which these remarkable results have been attained, I am to ask your attention in my lecture this evening. All bodies when heated to a sufficiently high temperature emit light. Indeed, it can be readily shown that light is a necessary result of a high temperature. A bar of iron heated in a blacksmith's forge, a mass of coal burning in a grate, the gas which illuminates our hall, are all illustrations of this general principle. In all these cases the light emitted has no particular color, and is what we call a "pure white light." And the source from which light is emitted in every case is a solid body. Moreover, what is true in these limited instances, we find to be a universal truth, namely, that an incandescent solid body always emits pure white light. But before we can deduce any safe conclusion from this general principle, we must understand what is meant by pure white light—for white light is not, as is frequently supposed, a simple sensation—but, on the contrary, is a very complex sensation. It is to Sir Isaac Newton that we owe the first analysis of white light. He found, on passing a beam of white light through a glass prism like this that it became divided into different colored rays. We shall repeat his experiment late in the evening; but for the moment the diagram I have here will enable me to explain the process he employed. If a beam of sunlight enters a dark room through a slit in a shutter, as any one knows, the beam crosses the room in a rectilinear direction, and forms on the opposite walls an image of the slit. But if we interpose between the slit and the wall a glass lens, we shall obtain a perfectly different image of the slit, such as is indicated here. If now still further we interpose in the path of the same beam a prism, we find that the prism produces two distinct results. In the first place it bends the beam, so that the image of the slit, instead of being opposite upon the wall, is thrown very much to the left, and will fall very much in this direction. But in the second place, it spreads out the beam just like the rays of a fan; and we have formed, instead of the single image of the slit, a broad band of blending colors called the "solar spectrum." If, now, by any means we recombine those different-colored lights, we obtain—as I shall show you—the pure white light again. From all this it follows that the white light is a very complex sensation; it is simply the confused impression produced upon the eye by the simultaneous effect of light of every different shade of color. Pure color, on the other hand, is a simple sensation; but most natural colors are not simple colors. Thus, for example, the color purple is a complex color, formed by the blending of tints of red and violet. Now, we can easily discover the different hues of which any given color consists, by simply passing the light that emanates from the source through a glass prism, when we shall divide it up into its simple constituent tints. On account of the great interest which attaches to studies of this kind, a class of instruments has been invented for analyzing colors, to which we give in general the name of "Spectroscope." We have one of them here before us. It is not necessary for me to enter into any detailed account of the mechanism of this instrument, for it is exceedingly simple, as might be gathered from what has been said on the subject. It consists of several parts. We have here the slit through which the light enters; we have the glass prism which bends the ray, so that it passes down this second tube. Moreover, we have a small telescope to give a well defined image of the slit. If, then, we direct this instrument towards any source which gives us a pure colorless flame, we see simply an image of the slit; but if we direct it towards a colored light, or a light containing several simple hues, we see just as many distinct images of the slit as there are separate colors. And the reason of the diversity is this: the glass prism bends each separate color to a different extent. It bends the red color the least, and the violet the most; and, therefore, those separate tints become separated along the band which we call the spectrum. Now, if our colored light consists of one single tint, we get a single image. If it consists of three tints, we get three images. If it is pure white light, which contains every gradation of color, then we have an infinite number of images of the slit, which succeed and overlap each other and thus blending form the band which I have already pointed out. Understanding now what is meant by "white light" we may return to the point from which we started—that an incandescent solid body always emits pure white light. What is true of solid bodies is also true of liquid bodies which can be heated

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to a temperature where they become incandescent metals—as, for example, molten metals—they also emit white light. Mark, now, the important conclusion to which this necessarily leads: If we can reason from analogy it follows that whenever we see white light the luminous source is a solid or a liquid body. And, so far as our experience of the surface of the earth goes, this is universally true. And analogy must lead us to suppose that it is a general law of nature. Now, the light which comes from the sun and moon and most of the fixed stars is a pure white light; then it would follow that the sun and the fixed stars are solid or liquid incandescent bodies.

The learned professor then proceeded to describe "absorption bands," especially those seen in the solar spectrum; and concluded by exhibiting upon an immense screen upon the platform the spectra of all the most important metals. These, of course, were extremely beautiful, and elicited unbounded applause from the audience.

Value of Zinc for Roofing.

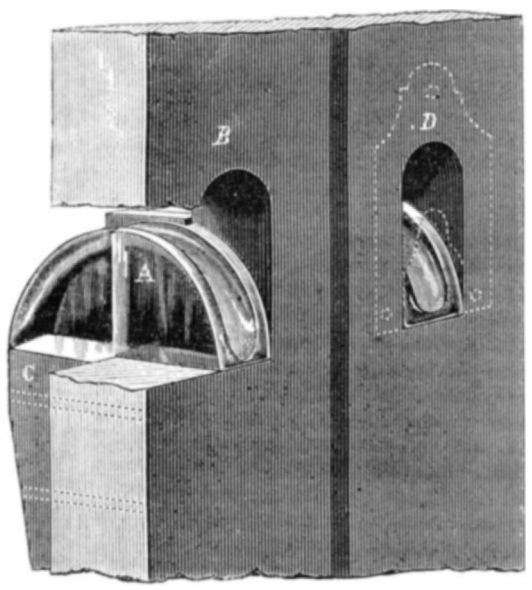
A correspondent asks, "What is the relative value of zinc and tin for roofing?"

The relative value of zinc and tin for roofing purposes depends so much upon variable conditions that it can hardly be stated in a simple affirmative or negative answer. Its comparative cost with other roofing material, slate, shingles, etc., cannot for the same reason be definitely stated. The gases arising from the combustion of bituminous coal, would not, in our opinion, under ordinary circumstances affect its durability. The connection of copper with zinc roofing is not advisable, as the galvanic action likely to occur under such an arrangement would render the zinc less permanent. A coat of any oil paint would tend, of course, to preserve it from the oxidization which takes place on its exposure to damp air. The coating of oxide which forms upon the surface of zinc thus exposed, tends, however, to protect the metal from further oxidization, so that it will last a long time without any other protection. There is no doubt that for many localities it is one one of the best as well as cheapest of roofing materials.

BICKNELL'S PATENT AMERICAN WINDOW WEIGHT PULLEY.

As the inventor says, the title of "pulley" is a misnomer, the device being simply a segment—one half—of a pulley; but the object intended is that attained by the ordinary revolving pulley. The engraving shows the stile of a window frame, containing a semi-disk, or half circle, made of glass, groved on its periphery to receive a cord, and having shoulders, or rebates, on its sides and on the bottom to hold it in place. The glass segment, A, is set in a mortise through the stile, B, and a similar but narrower mortise—to conform to the reduced thickness of the segment—in a bracket or supplementary stile, C. The dotted lines at D show a thin plate of metal screwed on the window frame to conceal that portion of the mortise necessary only to admit the glass segment. No screws, pivot, plate, or recessing, beyond the slot through the stile, necessary for ordinary pulleys, are required; the segment being merely passed in from the front, and then being held securely by the ledges on its sides and bottom resting against the sides of the mortises.

The cord sustaining the window weight merely slides in the groove of the segment over the smooth glass surface, and thus all creaking of pivots or axles, so annoying to the ill or nervous, and all necessity of occasional oiling is obviated.



The inventor claims the following advantages: Simplicity in construction and application; non-liability to derangement, no screws; no letting in of face-plates; less expensive than other devices; greater friction on the cord, but less wear, requiring a less proportionate weight to balance the sash, and giving a longer life the cord; no rusting, and always in order, not being affected by the weather.

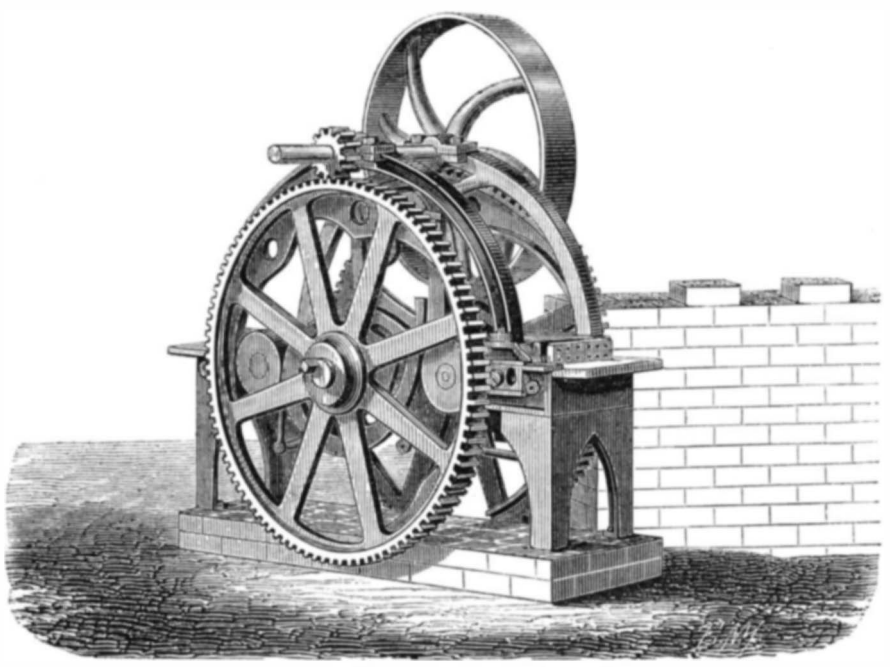
This device was patented through the Scientific American Patent Agency, Nov. 3, 1868, by Alfred Bicknell. For further information, address American Glass Pulley Company, 56 Congress street, Boston, Mass.

Another Balloon Project.

We received a call the other day from Monsieur Chevalier, of France, who heralds himself as a distinguished aeronaut. His object in coming here is to perfect his improvements in balloons, and to raise funds to make an experimental trip across the Atlantic ocean. He has brought a balloon with him in which he proposes to make the return trip to Europe. It is 95 feet in hight, 150 feet in diameter; capacity for gas, 125,000 cubic feet. The car, made of bamboo, resembles a long bamboo hut. M. Chevalier wishes to start before the warm months, so that his balloon may not be affected by the hot sun. It is his purpose to rise to an altitude of 10,000 feet, where he believes he will enter a steady current running eastward, and thus by it be conveyed to the continent of Europe. We wish Monsieur Chevalier success.

Improved Machine for Pressing Bricks.

The use of bricks as a substitute for stone for building purposes is almost as old as written human history. Even the burning in the kiln, which was probably preceded by simple drying in the sun, is of very great antiquity; for we read in *Genesis* XI. 3, the agreement of Noah's posterity when they planned the city and tower of Babel: "Go to, let us make brick and burn them thoroughly."



From that remote period to the present time the manufacture of bricks has been an important branch of the industry of civilized peoples. Yet until within the memory of the present generation, indeed, until within about thirty years, the machinery for preparing the clay and the methods of forming the bricks were of the simplest and crudest sort. The successful combination of the pug mill and press, in 1839, marked an era in brick making, and although successive attempts have failed to produce *perfect* bricks, in some instances, the evidence that a superior article *can* be and *has* been made by machinery is too positive to admit of doubt.

The accompanying engraving represents a press that produces a very elegant article, which appears to be all that could be desired in this building material. The machine is known as the Niagara Brick Press, and is the subject of six different patents, dated, respectively, Oct. 23, 1866, March 12 and 26, and Aug. 27, 1867, and Jan. 7, and Feb. 11, 1868. It is a horizontal piston machine, "double-ender," pressing and delivering three bricks at one end and then three at the other end, six bricks to one revolution of the wheel. It has a simple crank movement. The pistons are perforated, and the surplus clay, air, and moisture, escape through these perforations, in the act of pressing. The material used is moist clay; this is considered preferable to dry clay, although the machine will produce very excellent bricks from dry material. The bricks are very solid, perfect in form with well defined edges, of uniform size, of grainless density, breaking true and square to the trowel. The exposed surfaces (edges and ends) are perfectly smooth, highly polished, and glazed, rendering them impervious to moisture and not liable to discoloration by the action of the elements. From the specimen before us, sent as an average brick (in fact, it is claimed that their uniformity makes a selection impossible), we consider the product all that could be desired. The numerous testimonials from architects, masons, and builders, who have used them, and the fact that the company have on hand very large orders for brick to be delivered in the spring, would seem to give reason for the following apparently sweeping claims made by the company owning the patents and conducting the manufacture:

"1st, Perfection of form, being perfectly true and square, with well-defined edges and angles, and of greater specific gravity than others, rendering them capable of being laid with less labor, to a closer joint, and producing more solid, stronger, and handsomer work; 2d, beauty of finish, the exposed surfaces being polished or glazed, impervious to moisture, and not liable to discoloration or stain from dust, smoke, etc.; 3d, great strength and toughness for resisting strain or pressure; 4th, without grain, allowing them to be cut into moldings, or to any desired form, without waste; 5th, durability, not being injuriously affected by the action of the elements; 6th, adaptability to any particular service where bricks are used; 7th, made of moist tempered clay, and having all the good and none of the objectionable qualities of the mud bricks; 8th, can be manufactured at all seasons and in all weathers; and 9th, they are superior to other bricks, and can be produced at less cost."

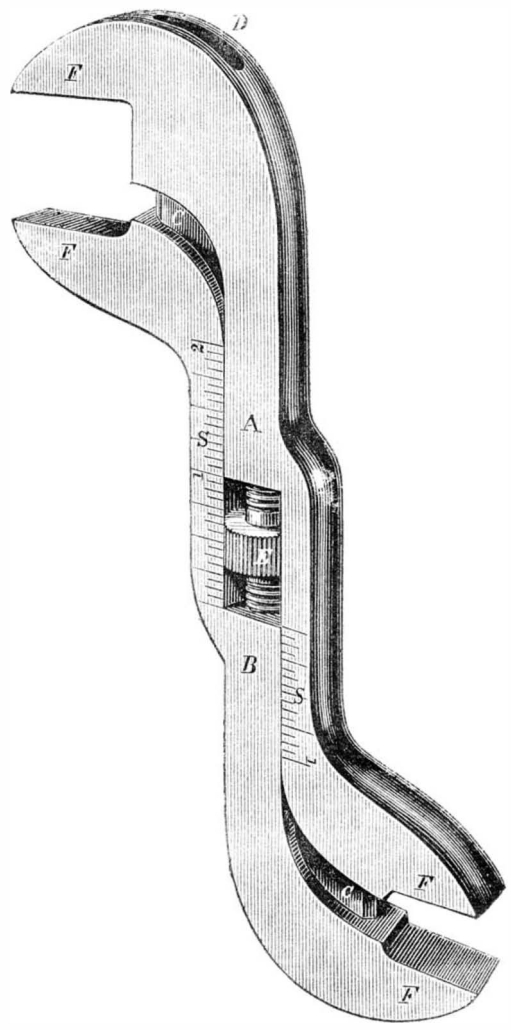
The machines are made of different sizes. The capacity depends, of course, on the speed with which they are worked. A No. 1 machine requires an engine of from fifteen to twenty horse power to drive it; and will produce from 15,000 to 35,000 bricks per day, according to kind required, whether "Fronts" or "Common." Machines, State, county, and yard rights for sale by D. P. Dobbins, Sec., Niagara Brick Press Co., 346 Main street, Buffalo, N. Y.

MODERN WRENCHES AND THEIR ANTECEDENTS.

It would be difficult to trace back to their primitive forms any of the modern tools in most common use; but there are many now living who can recollect the rude and uncouth shapes of many tools as they existed fifty years ago. Could the comparatively rude and clumsy tools of that period be placed side by side with those of the present, perhaps no better illustration could be given of the march of mechanical improvement during the last half century.

The screw and nut are among the oldest elements of machinery, and from their first introduction, some kind of wrench was required to turn either the nut or the screw. Probably one of the earliest forms of the screw-head was that now in common use in jack-screws, perforated; the nut being fixed, and the wrench being a simple lever thrust into the perforation. It is quite probable also, that the first appliance for turning nuts upon a fixed screw was also a simple lever or bar, thrust into a hole made for the purpose in the nut. In that case, the nut must have been very large and clumsy, and the advantage of a reduction of size, and a different mode of turning it must have soon become apparent.

The primitive form of the wrench for square nuts, must be a matter of conjecture, but it was, probably, either that known as the "pot hook" wrench, a bar of iron bent twice at right angles, or that form which has its jaws parallel to the shaft, or handle, and in which the nut is grasped so that the axis of the handle prolonged would pass through the axis of the screw instead of to one side as in the hook wrench.



The discovery of the S-wrench might easily have occurred by the accidental bending of the handle, the jaws being then rendered diagonal to the axis of the lever. Its advantages, once recognized, could hardly have failed to secure it at once the favor with which it has always been regarded.

The wrench, having its jaws at right angles with the shank, is also a very convenient form of wrench, and is the parent of the numerous family of adjustable wrenches, known as "monkey wrenches," "screw wrenches," "hammer wrenches," etc. All these wrenches have been useful and valued tools in their day and generation.

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It is only within the last twenty years that any successful attempts at making the S-wrench adjustable have been made. The original adjustable diagonal, or S-wrench, invented by Wm. Baxter, and patented by him in 1856, is familiar to most mechanics, and therefore needs no description here. It was, if we mistake not, the first wrench of the kind ever patented. It was also described and illustrated by an engraving in our paper about the same time. The inventor did not meet the pecuniary reward for this improvement to which its merits entitled him, as, during nearly the entire term of his patent, he was absent in Mexico superintending important mining and manufacturing enterprises. Upon his return to the United States last spring, his attention was turned to further improvements upon his original device, which resulted in the invention of the entirely novel and practical device illustrated herewith.

The object of the invention is to render the jaws of S-wrenches adjustable, so as to fit different sizes of nuts, at the same time avoiding the clumsiness and unwieldy nature of the ordinary adjustible hammer and other wrenches, and preserving the proportions which give to the ordinary non-adjustable S-wrench its value in so many instances.

By referring to the engraving it will be seen that the wrench consists essentially of two parts, A and B, mortised and tenoned together, the mortises, D, being formed in the *exterior* jaws, and the tenons, C, in the *interior* jaws of each part. These parts are combined with a right and left hand screw, E, with a thumb piece to operate it, so that by its rotation the jaws, F, are opened or closed. The plane of movement of the two parts is in the direction of the length of the wrench, and at right angles to the jaws. Upon the sides of the two parts, A and B, in the smaller sizes of the wrench, are scales, S, which, in combination with the screw and thumb piece, E, enable the wrench to be used as a calipers for measuring iron or nuts.

It is worthy of notice that the mortises and tenons are formed upon that side of the division line between the two parts of the divided shank nearest their respective jaws, so that, without increasing the size or amount of metal in the jaws, their strength is preserved while projecting them out from the shank and giving them that bill-like shape, which is requisite to an S-wrench.

It will also be observed as an excellent feature that the jaws are so arranged, that when one pair is entirely closed the other pair is open to the maximum extent to which the closed pair is capable of opening, thus giving the wrench a scope from very small to very large nuts; and also rendering at each adjustment two sizes available to the workman using it. The effect of the right and left hand screw is to give simultaneous and equal movement to each jaw of both pairs to and from each other, obviating so much turning of the thumb piece as is necessary where one jaw is fixed and the other is movable, thus adding to the convenience of the tool in use. The thumb piece is arranged in a recess shown in the engraving, and is entirely out of the way in use, while it is with great facility adjusted to the requirements of the work.

The right and left hand screw may be actuated by a pawl and ratchet, worm and rack, or any other means, but the method shown in the engraving, and herewith described, is much preferred, and is the form adopted by the manufacturers as best adapted to the purpose.

The wrench is exceedingly strong and durable, being made of malleable iron, so manufactured as to approximate in quality to the celebrated Bessemer steel.

For further information, address Baxter Wrench Company, 10 Park Place, New York city.

Portable Engines.

With the higher pressure and greater speed at which portable engines are now worked, as compared with the practice of ten years ago, the necessity of lengthening the tubes and contracting their diameter should be apparent. The reasons are of the same nature as those which require 11 feet or 12 feet tubes, 1⅞ inches only in diameter for locomotives. A Wiltshire firm, of some years' standing, has from the first acted upon this obvious view, and their ordinary commercial engines, for they make no "racers," invariably come off first in their class in the Royal Agricultural Society's trials. The long boiler, with correspondingly longer wheel base, gives a steadier engine when working, or when drawn about, and it permits also of a longer connecting rod, thus diminishing the friction on the guide bars. The same firm have for a year or more adopted a form of feed water heater, in which the water is heated by waste steam nearly or quite to the boiling point. Theoretically, this should save upwards of 15 per cent of fuel, and we believe the saving in practice is not less, to say nothing of the lessened wear and tear of the boiler, the admission of cold water doing much injury. An 8-horse engine, working ten hours a day, will burn about 5 cwt. of coal, and at 20s. a ton, a saving of 15 per cent would amount to 4s. 6d. per week, while, also, there would be a further considerable saving in repairs due to the lessened quantity of coal burned. A very few weeks' constant work would thus soon effect a saving at least equal to the cost of any reasonably simple appliance for saving fuel, a fact of which purchasers of portable engines should be sensible when giving orders.—*Engineering.*

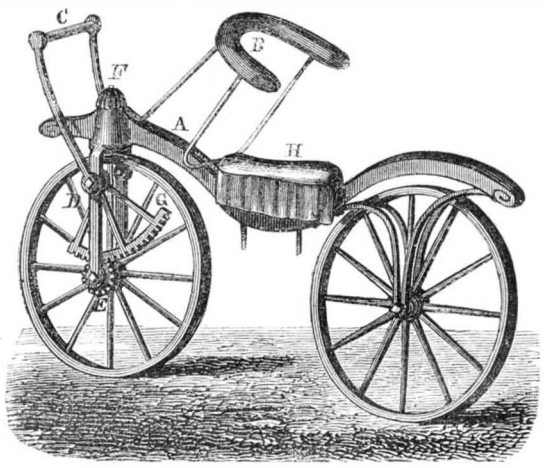
[We cannot agree with our London cotemporary. For tubes two inches in diameter it has been found by practice in this country that the length should be not over six feet to insure the best results.—EDS. SCIENTIFIC AMERICAN.

THE *Raleigh Standard* says the great need of the State of North Carolina is "young men who will identify themselves with her interests and destiny—young men who will work—young men of good habits, honest and reliable." The same want is sensibly felt in this city, and we presume many other places are suffering from the same affliction.

VELOCIPEDE NOTES.

The papers have somewhat less to say upon the subject of velocipedes this week than last, but the *furore* both among the inventors and users of them is by no means abating. Some extremely curious and novel two-wheeled velocipedes have been submitted to us, in which the wheels are placed opposite each other instead of one behind the other. As machines for ladies' use, some of them are destined to obtain favor unless we are much mistaken. Three-wheeled machines are also multiplying in number, and the various ways of applying muscular power to their propulsion do not seem to be yet exhausted. Four-wheeled velocipedes are also attracting some attention, and there can be no question that this class possess some advantages which go far to compensate for their deficiencies. We have seen a design of a five-wheeled velocipede for clubs, capable of carrying twelve athletes, which seems superior to the one of English origin recently described by us, but the particulars of which we are not at liberty to publish. The fifth wheel is used, of course, as a steering wheel.

A velocipede invented by Baron Von Dray and improved by Lewis Gompertz of Surrey in England, with an engraving and description of the same, extracted from the 39th volume of the Repertory of Arts, published in 1821, is herewith presented to our readers. It will be seen that it has many features in common with the ones now in vogue, but the method of propelling it is quite different.



The object of the improvement of Gompertz was to bring the arms of the rider into action, in assistance to his legs. It consisted in the application of a handle, C, which is to be worked backwards and forwards, to which is attached a circular rack, D G, which works in a pinion, E, with ratch wheel on the front wheel of the velocipede, and which, on being pulled by the rider with both hands sends the machine forward, and when thrust from him does not and it back again, on account of the ratch which allows the pinion to turn in that direction free of the wheel. H is the saddle, and the rest, B, is so made that the breast of the rider bears against it while the sides come around him at some distance below the arms, and is stuffed. The rider could, with this machine, either propel it entirely without the feet, or he could use the feet while the arms were free. The beam, A, was made of beech wood, and a pivot at, F, allowed the front wheel to be turned to the right or left at the will of the rider. This must have been, although somewhat clumsily shaped, a quite efficient machine, good for the times—forty-eight years ago.

The latest novelty is the first number of a paper, *The Velocipedist*, which has made its appearance in New York. It is a quarto of eight pages devoted to velocipede news, and is published by Pickering & Davis, 144 Greene street. It is to be issued monthly.

At the opening of their new school at No. 65 Tenth street, in this city, the Messrs. Hanlon gave an exhibition of skill which was said to have been very entertaining.

Alive to the value of pleasing accessories, the Messrs. Hanlon had procured the services of a good brass band. The riding of Fred. Hanlon was quite remarkable, being of that excellence to be attained only by one who is already a skilled gymnast. He leaped on and off the saddle of the velocipede when in rapid motion; sat upon it, guiding it with the feet only; carried his legs over the leading wheel, and thus sat, preserving his equilibrium with the rudder-post, and rode side-saddle-wise with ease and grace, illustrating admirably how easily the velocipede can be so fitted with a saddle, that ladies may ride with ease. By way of upsetting the prevailing opinion that the velocipede is valueless on a hilly road, Mr. Hanlon ascended a steeply inclined plane, made by placing one end of a board—some eight feet long—upon a trestle three feet high, the other end resting on the floor, thus forming an angle of about 24 degrees, and suggesting a grade equivalent to over 1,900 feet in the mile. This the velocipedist ascended with the utmost ease. It was also interesting to note how successfully he managed the machine under such awkward circumstances as might be supposed to surround a gentleman, who endeavored to reach home on a very dark night and very much intoxicated, using this modernest mode of locomotion. The drunkenness of the front wheel of that velocipede was amusing in the extreme, and at the same time terribly suggestive of ugly falls to its owner, and of the possibilities of his *scraping* acquaintance with you at every turn.

A Boston correspondent writes to the New York *Evening Post* that a two-wheeled velocipede of the Monod pattern has, during the last two weeks of pleasant weather there, been well tested as to its utility and durability by a young man living nine miles from the city, riding in and out on it almost every day. The average rate of speed attained was between eight and nine miles an hour, though a speed of ten and even twelve miles was attained in "spirts," or while racing with horses for short distances. The exertion required to move at these rates was comparatively inconsiderable, the momentum of the machine being easily kept up when once it is under way. The exhilarating and beneficial effects resulting from this exercise are more closely allied to those experienced from riding on horseback (which physicians so much recommend) than to any other. Though it requires but very little effort to keep the velocipede in rapid motion, yet the quick up-and-down movement of the feet, when the cranks are revolving rapidly, is wearisome if continued long. But this annoyance, we are glad to announce, is soon to be overcome by a very ingenious and at the same time simple arrangement (the invention of a Boston gentleman), so applied that a greater speed with a slower movement of the crank can be attained on declines, or on level ground; while, without dismounting or stopping, the gear may be easily and quickly changed to obtain more power for ascending hills, or running over rough ground.

The Boston *Transcript* says: "The velocipede mania is beginning to revolve in a lively manner round the 'Hub,' as well as elsewhere. Curiosity is awakened, invention stimulated, and experimentists are getting to be numerous. Two-wheelers, three-wheelers, and four-wheelers, and wheelers that can be multiplied or reduced in their rotary power as practice and skill may warrant, are rushing into the market. The schools have their pupils and spectators; and the not exactly novel—for something very like it has been known before—style of locomotion is rolling into favor as a popular notion, even if it should prove to be only a nine days' wonder. The various qualities of various machines are coming to be discussed with as much zeal as the diversified merits of horse flesh; and the dogmatists, wiseacres, and experts in regard to these new substitutes for legs are to be heard talking, as men are wont to talk of the wind, strength, bottom, gait, and 'go' of Eclipses, Dexters, and Ethan Allens.

"It is amusing to notice how rapidly this fresh idea has germinated, budded, and bloomed, and is actually bearing fruit in the way of active action. There are trials and competitions on the Common and in other convenient localities, as well as efforts and essays in halls up-stairs and down-stairs. Old fogies laugh; the sanguine prophesy a future population mounted on rolling stock that requires no oats; the boys are jolly over the whirling fun; and the question is getting to be an interesting one as to how extensively the social system is to be revolutionized. Something of utility, convenience, and economy may come of the innovation; meanwhile it is certainly the source of innocent amusement, steals time away from poor gossip, angry disputes, and promotes muscular development, even if it has not as yet—as it was predicted that the railroads would—turned the horses out to grass or filled the carriage bazaars with vehicles to be sold for a song, the owners having no further use for them. Therefore let the innocuous furor rage, say we; let it become contagious; let it agitate and convert everybody, at least until it shall, early in the spring, mount the members of the legislature, and swiftly send them off on various radii, to the enjoyment of their homes and private business."

In Rome, the Eternal City, the velocipede has broken out. A writer from that city says: "The last fashion is the velocipede. Gentlemen are practicing in their court yards, and one or two are daring enough to venture in the streets. One bold man has been seen on the Piazza di Spagna."

Velocipede schools have been opened in Springfield, Mass., and Lexington, Ky. Three of these schools are in operation in Newark, N. J., and the pupils number three or four hundred. A Massachusetts man has made a model for a one-wheel velocipede. It is to be a wheel eight feet in diameter, with convex spokes meeting at the extremity of the axle. The seat and the treadles which move it depend from the cranks on the axle, inside of the wheel, and the rider is, theoretically, to guide his steed as simply as a wheelbarrow is steered.

It is stated that the Executive Committee of the Michigan Agricultural Society, have arranged for a grand velocipede race during the ensuing State Fair. Premiums to the amount of $1,000 are to be distributed. Other committees, if wise, will follow the example thus set them. A velocipede race, by experts, would "draw" more than fat bullocks or balloon ascensions.

An inventive New Yorker has placed on exhibition at Pearsall Brothers' riding school, a three-wheeled machine, with which he thinks the ladies will be able to compete with the two-wheeled steeds of their gentlemanly cavaliers. It consists of an easy basket-work seat placed over two wheels. A small wheel projecting in front is guided by a rod passing back to the hand of the lady occupying the seat. The rear wheels have a pedal attachment, by means of which the lady can work up to a moderate rate of speed with but little exertion. The Messrs. Pearsall have introduced their pupils to some very difficult performances recently, the latest one compelling them to mount an inclined plane. A miniature hill has been thrown up at one side of their riding-room, about five feet high, rising at an angle of nearly forty-five degrees. Many of the pupils have succeeded in passing over it safely, but the majority of them, thus far, have reached the bottom, sadly mixed up with their velocipedes.

Mr. William H. Henriques rides, at Pearsall's school, a velocipede built by Wood Brothers, of the most elegant finish we have seen. The guide handles are of solid ivory, and the mountings combine both gilt and silver plate. Its cost was $165.

Miss Katie Putnam is astonishing the citizens of Davenport, Iowa, by her skillful management of the bicycular velocipede.

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To add to the effect she wears a bicycular garment, and thus attired "makes the machine fly."

A correspondent writes us from Lowell, Mass., that velocipedes have descended upon that city of spindles, and that with the coming of good roads, in spring, a velocipede freshet may be expected. They cannot avoid the contagious influence of this enlivening sport, it seems, even in the most industrious towns of industrious New England.

There is a very general complaint of the high prices maintained by manufacturers, but so long as the demand so far exceeds the supply, as is the case at present, a reduction is not probable, and although manufacturers are reaping a harvest from the business, the public must wait until competition has produced the so much wished for cheap velocipedes.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Centrifugal Force.

MESSRS. EDITORS:—Some of your correspondents having recently suggested centrifugal force as one of the causes of the open Polar Sea, and of the varying hight of the tides in different places, might not a brief examination of the nature of this force, and some of its effects as induced by the rotation of the earth be of interest to your readers?

The tendency of any particle of matter once set in motion, is to continue to move forward in a straight line, but if an external force is brought to bear in such manner as to constrain it to move in a curved line it will meet with a certain resistance, which is denominated centrifugal force. The amount of this force, as compared with that of gravitation at the earth's surface, can be found by squaring the distance in feet, moved by the body in one second, dividing by the radius of the curve described, and by 32·19 feet, the velocity which a falling body acquires in one second. Therefore, centrifugal force is in the direct ratio of the square of the velocity, and the inverse ratio of the radius.

If we apply the foregoing rule to the earth, we shall find that, at the equator, any object is drawn upward by this force, with a power equal to $\frac{1}{289}$ of that of gravitation. In other words, the weight of all matter at the equator would be about that amount more, were it not for the rotation of the earth on its axis. As there can be no centrifugal force at the poles, gravitation has there its full effect. It will be seen that this difference in the central forces of the earth would induce it to assume the form of a spheroid with its polar radius $\frac{1}{289}$ less than its equatorial. Actual geodetic measurements, however, make it $\frac{1}{300}$ less, showing that this effect is in part counteracted by other causes.

Let us now glance at the effect of centrifugal force at the 45th parallel of north latitude. Here we find that the radius of rotation has decreased (being expressed by the cosine of the latitude), and that the direction of the force is not in a plane perpendicular to the earth's surface, but is inclined toward the south at an angle equal to the latitude. If at this point a plumb line be suspended 100 feet in length, and acted upon by gravitation alone, it would come to rest in a direction pointing to the earth's center; but by calculation, we find that the earth's rotation will exert a force on the body thus suspende, equal to $\frac{1}{410}$ of its weight, tending to lift it and carry it southwardly at an angle of 45°. By resolving this force, we find it equal to $\frac{1}{580}$ acting in a horizontal direction, which in a plumb line 100 feet long, is sufficient to produce a deflection of 4·14 inches, or twelve minutes of a degree. This deflection of the plumb line is greatest at latitude 45°, and grows less as we proceed toward the equator or the poles. But does it follow from this that all our high buildings—whose walls are coincident with the plumb line—are not perpendicular to the water level? By no means. For if we calculate the influence which centrifugal force exerts upon water, we shall find that it is in equilibrium only when its surface forms a right angle with the direction of the plumb line, and coincides with the spheroid form of the earth.

Whoever gives this subject a close examination, will perceive that, so long as the velocity of the earth in its diurnal revolutions, remains constant, no effect will be produced on the currents of the ocean or on the tides.

Boston, Mass. JOHN M. ARNOLD.

Shot-Gun Barrels.

MESSRS. EDITORS:—In your issue of January 23d, page 55, "R. P. S," of Ohio, asks, "What is the best length for shot-gun barrels?" I have had considerable experience in such matters, and perhaps might give him a hint. For rabbits or partridges, a double-barreled gun need not be more than 24-in. barrels and 14 gage. For ducking on the Chesapeake, where they shoot from stands, the best is a 4-foot barrel (single), and of 5 gage. For ducking on the eastern bays, the best is a double gun, with 32-in. or 34-in. barrels and 9 gage. The best for all kinds of shooting is a 14 gage, 30-in. barrels of from 10 to 14 lbs. weight. I do not agree with you that 16 or 18 inches will produce as good an effect as the longer ones. First, there is more recoil. Second, the muzzle will throw up at the discharge, spoiling the shot. Third, the charge gets out of the barrel too quick, or, in other words, before the powder is all ignited. Take two guns equal otherwise, one 16-in. and one 30-in. The 16-in. will throw out part of the powder unconsumed (which may be seen if fired across snow); the other one will not. If the gun tapers from muzzle to breech, it will scatter, or if *vice versa*, it will give and cut the shot, and will, in course of time, spring the barrels. I have had a good deal of experience as a gunsmith, and being myself a gunner, I have tried almost all kinds of guns, and the statements I have given you I have always found to be correct.

Plymouth, Mass. THOS. MARTIN.

Liquid Fuel and American Inventions in France.

MESSRS. EDITORS:—As notice of the more valuable discoveries in the field of science commonly appears first in the columns of your journal, I desire to lay before its readers a few facts coming within my own observation on the above subject.

Through the kindness of the proprietors of an immensely large boiler and machine establishment in Paris, I was enabled to witness recently the practical working of liquid fuel, in a boiler running an engine of 15-horse power.

There were also present scientific engineers from the United States, Great Britain, Russia, and France, as well as dignitaries of the Empire, and numerous other gentlemen.

The oil, or the refuse of oil, was of an inferior kind, and every other circumstance was purposely so arranged as to make the exhibition a test under extraordinary difficulties.

After lighting, steam was quickly obtained and run up to the extreme limits and there held throughout; the engine working its full capacity on less than 2 gallons of oil per hour, evaporating 18 to the pound of fuel. After getting well under way the fire was safely left by the hour to regulate and fire itself while the fireman quietly smoked his pipe at a distance; this showing that one man could easily attend five or six liquid fuel fires, whereas if fired with coal, would require ten or a dozen men.

A singular phenomenon was observed during the latter part of the day. After several hours running and everything well heated, it was found that the ratio of oil consumed to the evaporation obtained gradually diminished, until at the close of the day it required hardly 50 per cent of the amount used at first, to produce equal results, apparently with all the other conditions unchanged.

I am told that this is a fixed feature of this invention. I leave it to some of your curious readers to explain. Now let us exhibit facts, leave others to draw conclusions. This liquid fuel costs here but 3 cents per gallon and it is officially demonstrated that the article in different grades can be had and even produced almost anywhere at a price tun for tun at a lower average cost than coal.

A tun of coal will occupy 44 cubic feet of a ships bunkers, Liquid fuel only 33. One pound of oil by this invention will evaporate nearly thrice, say twice as much water as a pound of coal; the former requiring in using but about one-tenth part the labor of coal, the element perfectly controllable, the apparatus simple, the supply inexhaustible. Why then is not the much invited question of liquid hydrocarbon as a fuel a perfect success? This was indeed the unanimous verdict of all the practical and scientific gentlemen present there. Indeed an elaborate report fully indorsing the above, has been made to the Emperor by a high official well known in the States. As an American I am happy to say the inventor of this system is also an American, invited here to test it; having done so satisfactorily, capitalists have bought the patent for several European countries, at a high figure. The value of this improvement as a steam generator having been definitely settled, the plans are now being made up for applying liquid fuel to making iron, steel, smelting over, working in metallurgy generally, for which the inventor claims it is even more valuable. It has been already demonstrated that all metals can be brought to the required heat by this system in less than half the time than by any other means. All influx of cold air through opening doors upon the molten metal is then avoided, but above, all, the effect of the sulphur, phosphorus, etc., found in all coal, and so deleterious to the texture of the metals, will be entirely obviated by the use of this new fuel, while the most intense heat will be obtained beside securing important chemical results. And here I should remark that the inventor has designed and patented a series of furnaces and metal baths specially calculated for this fuel, and which are pronounced much superior to all others.

French iron and steel manufacturers, give the whole system their hearty approval, and as above seen are adopting it. You may have noticed in the London *Times*, lately, several articles on this subject.

In conclusion, should I not return to the States too soon, I shall take occasion to give you hereafter a further account of the practical working of liquid fuel, its new field of usefulness. Its entire success however, seems to have been already established.

I should have been pleased to refer to names and particulars in this connection; but, knowing that your reading columns are closed to everything that savors of puffing, I have here confined myself to a plain statement of facts as they are, or may be seen by all. H. H. H., of Brooklyn, N. Y.

Paris, France., Jan. 5, 1869.

A Reason for Protection.

MESSRS. EDITORS:—In the last number of the SCIENTIFIC AMERICAN, I notice the question "Does American Industry Need Protection." I wish to suggest a reason for protection which I have never seen connected with the subject—one which appears to me conclusive. It has been estimated that the steam power and machinery of England is equivalent to 600,000,000 of laborers, while the United States has but 300,000,000. Without protection, England is likely to maintain her great superiority in this respect for a long time.

If her steam power could and would consume our agricultural products, there would be some excuse for free trade. We have not only her overwhelming number of laborers to compete with, but the overwhelming wealth they have accumulated. The cheap human labor, which has always entered into political economy, is of small account in comparison with the unconsuming slaves of England. It is this superiority which makes protection useless and inoperative there—it is abundant protection in itself. E. M. CHAFFEE.

Bridgeport, Conn.

Explosion of a Locomotive Boiler---Was it Steam or Gas?

MESSRS. EDITORS:—I have never seen in your columns a report from any one on a boiler explosion. A locomotive which exploded, Dec. 26th, attracted my attention, and as no theory of low water or formation of gas is admissible in this case, the cause of it is I think as I shall state. It was of the usual locomotive type, raised wagon top, and two 19-inch domes. The engine stalled with a pressure of 100 lbs., the blower was used until 130 lbs. was reached, the usual "off brakes" was blown, and the engineer told a brakeman, who was on the engine, to close the blower, and was in the act of pulling the throttle when she exploded, the brakeman said, "it was like pulling a trigger."

The boiler gave way in the gusset or throat sheet, about 10 or 12 inches below center of boiler. There was an internal defect in the sheet at that place; it was not welded but laid in separate layers each probably not over 1-16 thick. The force of the explosion was upward and to the right; as the defective place was immediately opposite a driving wheel, it forced it from axle in fragments, cutting the tire like lead. All the cylinder part of boiler was torn to pieces, and the wagon top to dome joint. The iron is torn in every direction, but there is not a place where the riveting has given way and where the sheets are torn, the fracture ceases when it comes to a line of riveting. The iron is not over ¼ thick, and is of good quality, with the exception of two or three defective places that are internal defects that the most careful examination could not have detected.

The cause of the explosion was weakness of the boiler, which is probably the cause of all the explosions. Water at a temperature of 212° makes 1700 times its volume of steam, which at a pressure of 100 lbs. is only 295, and at 130 lbs. but 233. The blower was ½ inch diameter, and steam issued from it at the rate of 1000 feet per second. In shutting off blower, this current of steam was checked; while a gush of of flame filled the firebox and flues, by being checked by the closing of the blast. As the weakest point always yields first, and the steam and water thus liberated expanded, as is shown above, and the flow took place towards the vent, the momentum of the water with its pressure tore everything in its way until its force was spent. This is apparent from the flues, which are spread out and scattered as if to give room for the water to escape, and the outside flues are flattened as if they had been forced against the boiler before it gave way. The force exerted is something wonderful, when we take into account that the wheel had been put on with a pressure of 60,000 lbs., and a well fitted key driven in afterwards and then the tire shrunk on. The frame, of 4-inch square iron, was broken short off, and the reverse arm weighing probably 100 lbs. was thrown about 500 yards. It may be said that the water or steam is not capable of acting thus, but is not this the same principle as the injector, as well as of the steam pump, where the steam acts directly against the water and forces it in the boiler against the same pressure as started it

S

Huntsville, Ala.

[Our correspondent is in error as regarding the relative temperature and pressure of steam. According to Regnault the temperature of steam at 100 lbs. pressure is 336°, and at 130 lbs. 355°.—EDS.

Discharge of Water Under Different Heads.

MESSRS. EDITORS:—In a recent issue of the SCIENTIFIC AMERICAN, in the "Answers to Correspondents," I notice you say that "200 square inches of water under 4-feet head is not equal in quantity or power to 100 square inches under 16-feet head." I have always understood it would not be equal in power, but have always understood that the discharge of water from the same sized opening, in the same time, would vary as the square root of the heads of water under which such opening was placed: that is, the square root of 4-feet head being 2, and the square root of 16-feet head being 4, there would be twice as much water vented under the 16-feet head in the same time from the same opening that there would be under 4-feet head. You would confer a personal favor on me and probably upon many others, by replying to this. The ratio of contraction may vary a little in your described circumstances, but as there was no mention made of it, I suppose that it did not enter into your calculations, as it does not in mine. T. H. RISDON.

Mount Holly, N. J.

[Our correspondent is right in his opinion that the amount of discharge which will take place from equal and geometrically similar apertures, is theoretically proportional to the squares of their respective distances below the surface. The reply to which he refers had no reference to the flow of water under a constant head, but simply to the statical effect and weight of two columns having specified areas of base and given hights.

Eccentric and Crank Combined.

MESSRS. EDITORS:—I noticed in the SCIENTIFIC AMERICAN, page 21, current volume, a week or two ago, under the above heading, a communication from D. H. McCormick in relation to the valve moving apparatus of the *Keewenaw*, and in which he has overlooked a very important point, as I think. Two years ago last summer, I was on board the *Keewenaw* and became very much interested in the valve gear, so much so that I examined it very attentively. Mr. McCormick has correctly described it with the exception that he makes a joint in the eccentric rod at the point of contact with the fulcrum, which does not exist, or did not when I saw it. I did not discover any slot in the crank, but accounted for the unequal length at different points, by the long connection and its elasticity

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There might have been a slot for the crank pin but I am sure there was no joint in the connection. N.

East Saginaw, Mich.

Sal Soda and Soda Crystals.

MESSRS. EDITORS:—From a partial copy of House Reports, 1,349, sent to me some time ago, I noticed the proposal to advance duty on sal soda and soda crystals to one cent per pound, or one-half cent more than actual duty; also to advance duty on caustic soda two cents per pound, or one-half cent more than actual duty; bleaching powders, now subject to a duty of thirty cents per 100 pounds, to be put on the free list. If it is really the intention of Congress to protect the manufacture of soda salts, duties should be so arranged as to promote competition between the manufacturers of these salts from chloride of sodium and those handling the kryolite monopoly. With the present high price of common salt (chloride of sodium), and the proposed abolition of duty on bleaching powders, that competition will be rendered impossible; for, by using chloride of sodium, an immense quantity of muriatic acid (hydrochloric acid) is obtained, which is of little or no value to the manufacturer if he cannot use it in the manufacture of bleaching powders. If, therefore, the duty on soda salts is increased, the duty on bleaching powders should also be proportionately advanced, and in no event should they be put on the free list. There is an able paper, from Dr. Squibb, in reference to soda salts, published in the Pharmaceutical Association Reports for 1867, but the doctor is evidently mistaken in speaking of a California mine of profits to the manufacturers of soda salts from chloride of sodium. At present there is scarcely a margin of profits left to them. It is different, however, with the kryolite monopoly.

AN OLD SODA-ASH MANUFACTURER.

Cleveland, Ohio.

[Our correspondent's point seems to us well taken.—EDS.

Four Pounds of Butter from a Gallon of Milk.

MESSRS. EDITORS:—In a recent issue of your journal allusion was made to a newly-discovered butter process, whereby one pound of butter and one gallon of milk was said to produce four pounds of good butter. Your remarks thereon were to the effect that if four pounds of butter were produced, over three pounds must have been put into the vessel from which it was taken. Examination of butter produced by the same process in this city seems to confirm your assertion—the product is not butter, but appears to be produced on the same principle as a soap-maker produces soap; in one case one pound of butter and one gallon of milk put into the apparatus, and a powder added, presently out comes the butter. In the other case, the soap-maker puts a certain quantity of fatty matter, and a correct proportion of water; the addition of an alkali produces a union of the opposite substances, and soap is the result; the action seems to be analogous in each case. Potash produces soft soap, from its strong affinity for moisture; soda produces hard soap; it seems probable, therefore, that the powder is a refined preparation of caustic soda.

ENTERPRISE.

Cincinnati, Ohio.

[Our correspondent is right in his views. The use of alkaline carbonates to make water combine with, and increase the weight of lard is an old trick, and it has now been extended to butter. We understand some of these imposters use alum also. It is a striking illustration of the ease with which public imposition can be practiced that such a bare-faced swindle as this can prove successful.—EDS.

Efficient Tank, Condenser, and Water Heater.

MESSRS. EDITORS:—I have written an article embodying a plan of arrangement which I adopted some years ago, and the ideas of which I got from careful readings of the SCIENTIFIC AMERICAN, and would like to help others to a cheap way of overcoming some difficulties which we meet in the West in driving steam engines.

Reading the article on page 60, present volume, by F. W. Bacon, I have been induced to describe an arrangement I made in 1859 on placing a new boiler in position. Had the flues removed from the old one (18 feet by 40 inches), and the boiler heads fastened up tight; hung this boiler over the new one for a water tank, at a sufficient height to allow of the boiler being filled from it through the safety valve; introduced the exhaust pipe from the engine into this tank on the upper side at one end, carried another exhaust pipe from the other end through the side of the engine house into the atmosphere. The force pump was bolted directly to the standpipe, the feed water taken from a point about six inches above the bottom of the tank, allowing space for the deposits of sediment. The exhaust steam passing over the surface of the water in the tank kept it at 212°, and owing to short connections between force pump and boiler, reached the latter without any sensible diminution of heat. Some of the advantages of this plan are as follows: The feed water deposited nearly or quite all of its sediment, also a large proportion of the carbonate of lime contained in it; had always a large body of hot water on hand for purposes aside from boiler supply; and its value as a condenser was one of its chief merits. While the supply pump was running, all the exhaust steam was condensed, or a large proportion of it, until the water reached its maximum heat, and after that condensation still went on slowly. The tank could be filled to the level of the second exhaust, and if the pump was not stopped, the surplus water ran out of the pipe; the force pump being so closely connected to the boiler, friction was prevented, which always attends feed pipes between the force pump and boiler, and power served thereby. I found it necessary to clean the tank twice a year, and the amount of sediment removed, which, with the ordinary arrangement, would have passed into the boiler, was enormous. This is still in use, and giving perfect satisfaction; and during the nine years that I used it, I did not spend a dime in repairs.

Though I suppose this plan has been used by others, still I never saw it, and recommend it to those who cannot afford elaborate apparatus, as a cheap and effective method of combining tank, condenser, and feed-water heater, and also as a receptacle for the deposit of impurities that would otherwise pass into the boiler. Another advantage I have not mentioned is this: On extremely cold nights and during the cessation of work on the Sabbath, the large body of water in the tank will remain warm, thus keeping up the temperature in the engine house and preventing the freezing of pumps, pipes, etc.

T. L.

Central College, Franklin Co., Ohio.

Testing Steam Engines.

MESSRS. EDITORS:—I have been too much occupied to notice sooner Mr. F. W. Bacon's criticism on my articles on the above subject. I am sorry that Mr. B. considered it necessary to the successful presentation of his views to recall some visit to a repair shop, and suggest or imply some connection between what he saw there, and other matters which could not possibly have occurred there. The gentleman, for want of better argument, has fallen into a very common mistake which would have been far more clearly expressed had he said "I don't believe the statements, therefore they are not true." Like him, I once did not believe that the inaccuracies spoken of on page 308 of your last volume were of any practical value. I waited, however, till I experimented before expressing my opinion in print.

The fact that I used an English instrument in those particular experiments showed no want of confidence in American instruments. I have used all kinds and it is unnecessary to say that the Yankees can do as good work as any foreigner. The derangement mentioned, namely, that the pencil does not move in an exact line with the axis of the paper drum, is a common one to all indicators wherever manufactured. It is of less consequence than one would at first suppose, so long as the pencil gets a good bearing on the drum, for it in no way affects the accuracy of the diagrams when the measurements are made in lines parallel to the movement of the pencil. The defect is easily remedied by springing the bracket which carries the drum.

The remarks of Mr. B. about friction are in the main correct. Nothing is learned by criticising mere forms of expression. He acknowledges that the indicator does not show separately the friction of the engine and of the load. This is the main fact I wished to bring out, so it is equally correct to say that the indicator does not show the useful work an engine is capable of performing. CHAS. E. EMERY.

New York City.

Is Resistance to Speed of Steamers as the Square or Cube of the Velocity?

MESSRS. EDITORS:—A correspondent of the SCIENTIFIC AMERICAN, of 24th January, page 70, finds the above a "vexed question." To the present writer it is plain.

The power is the steam used in a given *time* and is as the cube of the velocity; but for a given *distance* as the square, the time of using the steam being shortened as the difference between the square and the cube.

To double the speed, four times the force on the piston, and quantity of steam are required, when the doubled velocity of piston and wheel demands also a double supply of the four-times force, making a consumption of eight times, or as the cube. If the ordinary time of a steamer were ten days from New York to Liverpool, to perform the trip in five days would require a supply of four times the coal and steam over the ten day's supply, or as the square, but the consumption of steam during five days, would be at the rate of eight times, or as the cube of velocity. T. W. BAKEWELL.

Pittsburgh, Pa.

Eccentric with Crank Combined.

MESSRS. EDITORS:—On page 69, Vol. XX., Mr. Palmer wants me to explain my diagram, which he says won't work unless there is something on the shaft not shown on the engraving to throw it over the center. There is something on the shafts to comply with this requirement in the shape of a crank on either end of the small shaft, X, with two double rods, and an eccentric on either side of the main crank.

But they are set at right angles to each other, so that when one crank is on the center the other is at a point furthest from it, thus producing a steady movement and in some manner governing the engine. D. A. MCCORMICK.

Safety in the Use of Kerosene Lamps.

MESSRS. EDITORS:—In the days of camphene there used to be a safety arrangement of wire gauze containing the wick, and attached to the inside of the lamp. Why is it that our kerosene lamp makers do not now use this simple safety contrivance? The feeling of security would be cheaply bought at the trifle additional expense. The gauze was also used on the nozzle and mouth of the can for filling, and also covered the receptacle and cock in the store. Many lives, much suffering, and many dollars might ere this have been saved, if our people had the sense to demand it. T. C.

Boston, Mass.

An Appreciative Client.

MESSRS. MUNN & CO., SIRS:—Having received the Letters Patent from Washington, dated January 26th, 1869, I now take great pleasure in returning my sincere thanks to you for attending to the claim which I entrusted to your care; and should I ever want other patents, never would I look for a more *reliable, careful, or experienced* counsel than you. In the future I shall recommend all that are in want of such aid to you. F. SIDNEY TOWNSEND.

South Seaville, N. Y.

Why Don't Boys Learn Trades?

The Philadelphia *Ledger* justly remarks that the present generation of young men seems to have a strong aversion to every kind of trade, business, calling, or occupation that requires manual labor, and an equal strong tendency toward some so-called "genteel" employment or profession. The result is seen in a superabundance of elegant penmen, bookkeepers, and clerks of every kind who can get no employment, and are wasting their lives in the vain pursuit of what is not to be had; and a terrible overstock of lawyers without practice and doctors without patients.

The passion on the part of the boys and young men to be clerks, office attendants, messengers, anything, so that it is not work of the kind that will make them mechanics or tradesmen, is a deplorable sight to those who have full opportunities to see the distressing effects of it in the struggle for such employments by those unfortunates who have put it out of their power to do anything else by neglecting to learn some permanent trade or business in which trained skill can always be turned to account. The applications for clerkships and similar positions in large establishments are numerous beyond anything that would be thought of by those who have no chance to witness it. Parents and relatives, as well as the boys and young men themselves, seem to be afflicted with the same infatuation. To all such we say, that the most unwise advice you can give to your boy is to encourage him to be a clerk or a bookkeeper. At the best, it is not a well-paid occupation. Very frequently it is among the very poorest. This is the case when the clerk is fortunate enough to be employed; but if he should happen to be out of place, then comes the weary search, the fearful struggle with the thousands of others looking for places, the never-ending disappointments, the hope deferred that makes the heart sick, the strife with poverty, the humiliations that take all the manhood out of the poor souls, the privations and sufferings of those who depend upon his earnings, and who have no resource when he is earning nothing. No farther, no mother, no relative should wish to see their boys or kindred wasting their young lives in striving after the genteel positions that bring such trials and privations upon them in after life.

How do these deplorably false notions as to choice of occupation get into the heads of boys? Why do they or their parents consider it more "genteel" or desirable to run errands, sweep out offices, make fires, copy letters, etc., than to make hats or shoes, or lay bricks, or wield the saw or jackplane, or handle the machinist's file, or the blacksmith's hammer? We have heard that some of them get these notions at school. If this be true, it is a sad perversion of the means of education provided for our youth, which are intended to make them useful, as well as intelligent members of society, and not useless drags and drones. Should it be so, that the present generation of boys get it into their heads that, because they have more school learning and book accomplishment than their fathers had, they must therefore look down upon the trades that require skill and handicraft, and whose productions make up the vast mass of the wealth of every country, then it is time for the controllers and the directors to have the interior walls of our school houses covered with maxims and mottoes warning them against the fatal error.

Coral Reefs.

Prof. Ebell, of New Haven, recently delivered a lecture at the Cooper Institute upon corals, mollusks, snails, and cuttlefish. These animals, it was said, belong to the class of radiata. The reason for thus designating them was given, and illustrated with diagrams. The coral was described as belonging to this class of radiata. There were three conditions mentioned as necessary to the growth of these animals and the productions of coral islands. First, a temperature of the water at or above sixty degrees. They will not live where the water is below that. They are found distributed in the ocean, not according to the lines of latitude, but according as the temperature is modified by ocean currents. Second, a depth of water not less than thirty feet, and not over one hundred is required. The structure of the animal is such that it cannot live at a greater or less depth, or at all events have a vigorous growth. A few are found at a less depth, but of so frail a development as to be broken off by the motion of the sea. The last essential is that the water be pure. Coral islands are formed around the base of a mountain wholly or in part submerged. The form of the growth of these islands is perpendicular toward the water, and shelving toward the land. These islands never rise nearer to the surface than thirty feet by the action of the coral animals themselves. Any nearer approach to the surface, or projection above it is attributable to the deposit, by the waves, of the frailer kind of coral found at a less depth than thirty feet, and broken off from the rocks by the action of the water. Sometimes the mountain sinks below the water, and then the coral deposits are seen in the form of a circle, with a lake or lagoon in the center. These lagoons are sometimes taken advantage of in the production of salt, water being let in and retained until it has evaporated and left a residuum of salt. Turk's Island salt, so familiar to commerce, is obtained in this way. From the consideration of corals the lecturer proceeded to the consideration of jelly fish, and thence to mollusks, and last of all, the cephalapods, to which class the cuttlefish belongs, was considered. The lecture was illustrated throughout with extemporized drawings on the blackboard, and afterward by more elaborate representations by means of the magic lantern.

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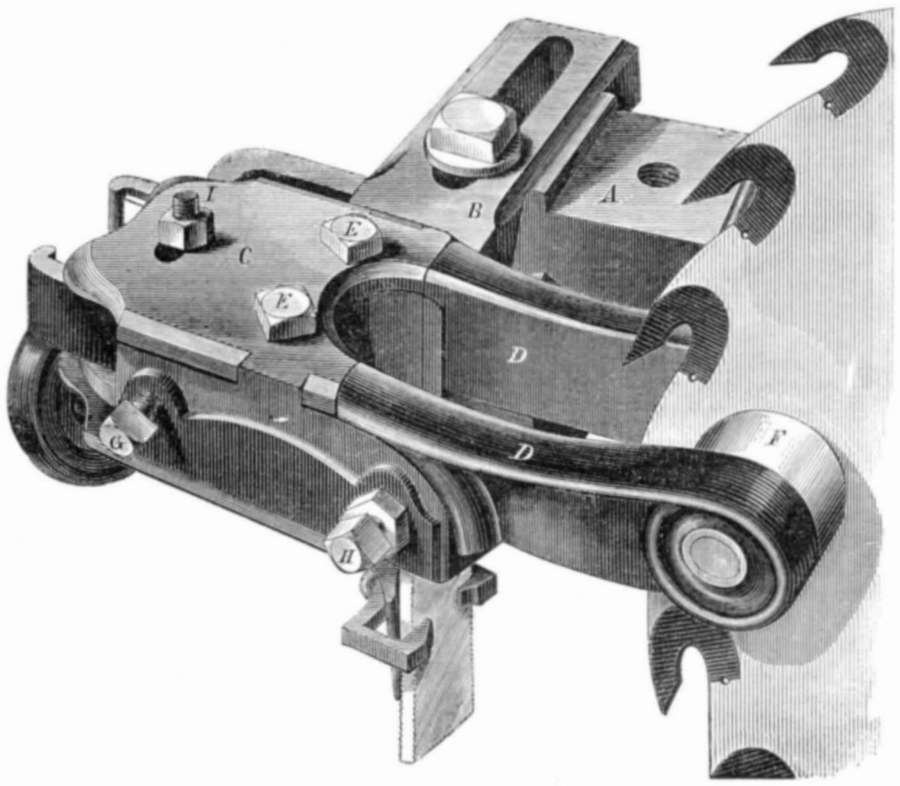
Improvement in Devices for Guiding and Trueing Circular Saws.

Large circular saws, when running swiftly, are liable to oscillate or spring at the periphery, or to describe a wavy or curved vertical line rather than a right vertical line. The cause is yet in doubt, but whether owing to unevenness in the texture of the plate, difference in its temperature by difference of speed between the periphery and center, or the effect of occasional and accidental obstructions, the fact remains, and a necessity exists for some device to steady the saw in working. This object is sought to be attained by the device shown in the accompanying illustration, marked Fig. 1. The guide is of iron, and is secured to the saw frame by the adjustable standard, A, on which the supporting arm, B, is bolted at the point shown in the engraving, or at A, as best adapted to the build of the saw frame. This arm sustains the guide proper, C, having two pivoted arms, D, which swing on the bolts, E, as pivots, and carry, each, a steady pin or roller, F, of wood, seen in the engraving impinging against the surface of a saw, a segment of which, with Emerson's inserted teeth, is represented. The pivoted arms, D, extend back under the cap, C, to the rear and receive between them a U-shaped spring by which the jaws or ends carrying the pins, F, are forced together. They are brought apart or adjusted by set screws, G, one on either side, and vibration of the jaws to correspond with that of the saw, is secured by the screws and check nuts, H.

Fig. 1.



NOYES' PATENT SAW GUIDE, AND JOINTER, AND GAGE.

It will be seen that the vibration given to the pins, F, will allow the saw to retain its course, while cutting, when the carriage runs out of line, thus saving a great amount of power. The device will also prevent a saw that is sprung from wavering or rattling. The pins or bearers, F, may be adjusted while the saw is running without endangering the hands. Every provision is made for varying the stand or guide in hight or horizontal position.

Fig. 2.

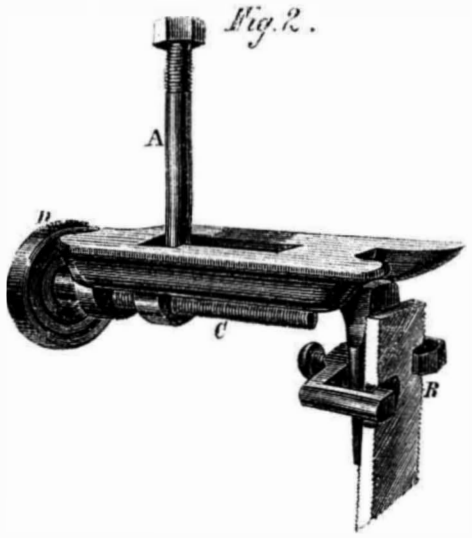


Fig. 2 represents the jointer, shown in Fig. 1 attached to the under side of the guide by the bolt I, Fig. 1, and A, Fig. 2. A piece of mill file, B, is clamped on a slide that may be moved forward and backward by a screw, C, turned by the knob or hand wheel, D. This is permanently attached to the guide ready for instant use when jointing is required, and out of the way when the saw is in use. It may also be made to be used independent of the guide if required.

Fig. 3, is a gage and square for setting and filing saw teeth, or rather for determining the set or swage of the teeth. The points, A and B, rest against the side of the saw and the teeth points revolve between the set screws, C. D is a wrench for setting the teeth.

With these appliances any man who can tend the brakes and set the log can keep the saw in order.

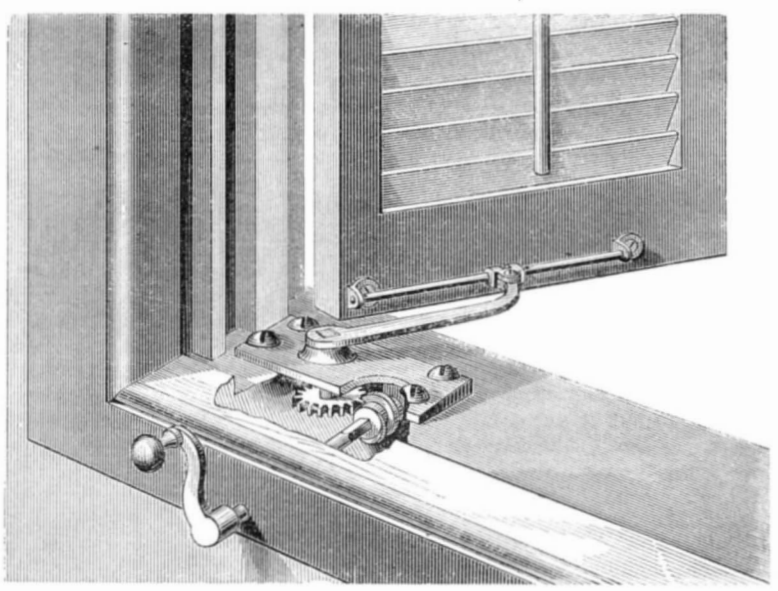
The patents to W. B. Noyes bear dates March 3 and Aug. 8, 1868. Orders should be addressed to W. H. Hoag, sole agent for the United States, 214 Pearl street, P. O. box 4,245, New York city. Baker & Noyes, manufacturers, Manchester, N. H.

Interesting Experiment in Electricity.

The Boston *Journal of Chemistry* gives the following amusing and instructive experiment: "Procure four glass tumblers or common glazed teacups, and having wiped them dry as possible, hold them over the fire to evaporate any moisture which may still adhere to their surface; for if there is the least moisture it makes a connection and spoils the experiment. Place them upon the floor in a square, about one foot apart; place a piece of board upon the tumblers, and have a person standing upon the board. This person is now completely insulated, the glass being a non-conductor of electricity. Now take a common rubber comb, and having wound a piece of silk around one end of it, rub it briskly through your hair, and draw the teeth parallel to the insulated persons knuckles, leaving a little space between the comb and the person's hand. The result will be a sharp, crackling noise, and if dark, there will be seen a succession of sparks. Repeat the process until the phenomena cease. The person is now "charged" with electricity, the same as a Leyden jar. To draw off the electricity, approach your knuckles to the person's hands or his nose (being careful not to allow any portion of your body to come in contact with his), and there will be a loud snap and the sparks will be very brilliant. If a cat be held so that the charged person can place his knuckles in proximity with the animal's nose, it will suddenly appear as if it were in contact with an electric battery. A glass bottle may be used in lieu of the comb, but it is not so well adapted for the purpose. Much amusement may be derived from this extremely simple experiment, and some of our numerous young readers will hasten to try it for themselves."

Improved Device for Adjusting Window Blinds.

If blinds to windows can be opened and closed in all weathers without raising the window, the device that enables this to be done is valuable. In winter, raising the window for this purpose, admitting the temperature of the frigid zones, even momentarily, is not pleasant; in summer, the consequent admission of dust is annoying; at any time or season, the danger of falling by leaning out of the window to fasten or unfasten the blind is not to be risked. Several devices for obviating these difficulties have been brought under our notice, and although we have found some good qualities in each, we have found no one so free from possible defects as that herewith illustrated.



BROOKE'S UNIVERSAL BLIND AND SHUTTER FASTENER.

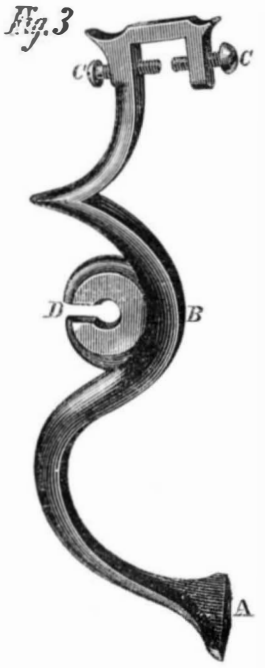
The engraving shows a device by which the blind may be opened or closed from the inside, and held in any position desired, either closed, fully open, or at any intermediate position, in all of which it will be securely locked. Attached to the frame of the blind is a rod upon which slides a sleeve pivoted to the outer end of an arm secured to the axis of a worm-gear seated in a recess in the window sill, and gradually rotated by a worm, the whole covered by a metallic plate, as seen, which may be made as ornamental by plating or japanning as may be desired. The worm, or screw, is turned by a shaft and an ornamental handle inside the room. As this handle is turned, the gear is slowly rotated, and its arm, sliding on the rod or bar, throws the blind back or forth, according to the direction of the rotary motion, opening or closing it as desired. In whatever position the blind is left it is immovable, except by having recourse to the handle, or crank, inside the room. The device is capable of being made highly ornamental as well as useful, as may be seen.

Patented by Wm. E. Brooke, October 20, 1868. Rights for sale and samples to be seen at the office of G. L. Taylor, 38 West street, Trenton, N. J.

The Safety of Steamships.

A correspondent, "An Engineer," writing to the *Times*, has hit the nail on the head, in so far as the clearance of water shipped by steamers in heavy weather is concerned. He proposes to lift the water from any part of the hold by means of steam jets, supplied from the boiler. It is astonishing that this simple application has not been before made. In the case of the Giffard injector, when feeding into a boiler under a pressure of 100 lbs. per inch, the water must be forced with an energy sufficient to raise it to a hight of at least 300 ft., but in the case of a steamship, with water in her hold requiring to be lifted 20 ft. only, a steam jet would lift between forty and fifty times its own weight of water. Thus, in the case of a steam vessel having boilers capable of evaporating 1,000 cubic feet of water per hour, the steam taken from them and employed in jets would lift at least 1,000 tuns of water per hour from the hold. The same amount of steam employed to work centrifugal pumping engines would, of course, do very much more, but the steam jet system has the advantage of great simplicity. Arrangements should be made for applying it in all steamers. It would, almost beyond question, have saved the *London* and the *Hibernia*. The following is the principal portion of the letter under notice, addressed to the *Times*:

Fig. 3



"In the steamships *London* and *Hibernia* we had from 500 to 1,000-horse power of boilers, all in good order, and plenty of coals. In other words, we had from 500 to 1,000 horses all ready and willing to work, all thoroughly under command, with plenty of food, and yet no harness for them; plenty of work for them to do, and nothing to do it with.

"I think it was Count Rumford who said the boiler was the soul of the steam engine, and truly here the spirit was willing and the flesh was weak.

"What is the best mode of utilizing all this power of work? It is not a question of economy of fuel, it is a question of life and death; and, therefore, while the arrangements for applying the power to eject the water should be effective, they must also be simple, ready of application, and certain to work when wanted, and also detached from the engines (for it is easy to see that the engines of the *Hibernia* could not have worked without a fly-wheel). If we are to have this, we must look about us for something simpler than pumps, either centrifugal or reciprocating pumps. All these require machinery, and take up much room, and may not be ready when wanted. What we should have is a direct application of the steam, either in the form of Savery's engine or in one of the many ways in which the steam jet is applied to raising water, feeding boilers, etc.; and by this means no machinery is needed, and the whole power of the boilers could be instantaneously applied.

"There is a well-known application of the steam jet for raising ashes out of steamers, but which would equally well raise water. It is simply an annular jet of steam round a six-inch pipe, which creates a vacuum and discharges the ashes through the pipe.

"Each apparatus requires about 5-horse power of steam to work them, and they would raise one thousand gallons of water per minute. They are simply six-inch pipes, standing vertically, and take up no more room than a stovepipe. They might be placed all round the side of the vessel by carrying a steam pipe to them, or they can be placed in any part of the ship.

"Now, if there was 1,000-horse power of boiler, you could have 200 ejectors before the whole power was utilized; but if there were only 20, 20,000 gallons, or about 120 cubic yards, of water would be raised per minute. By employing the whole power, 1,200 cubic yards of water would be ejected a minute.—*Engineering.*

[The plan here proposed and advocated has been used in this country for many years. Ejecting bilge water, and even raising sunken ships when not at too great depth, can be readily done with a steam siphon.—EDS.

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HOW CONTRACTS ARE AWARDED---GROSS FRAUDS IN THE PATENT OFFICE.

We recently alluded to the fact, that Commissioner Foote had called the attention of the Secretary of the Interior to the existence of certain frauds in the purchase of stationary for the uses of the Patent Office, and of the appointment, by the latter functionary, of a Committee consisting of B. F. James, Norris Peters, and E. W. W. Griffin, attachés of the Patent Office, to investigate the matter. We have now before us the report of a Committee, appointed by the House of Representatives, to inquire into the particulars, from which it appears, that notwithstanding the existence of the most astounding frauds, Messrs. James, Peters, and Griffin, were not able to discover anything deserving of censure. The House Committee proceeded to unearth this contract system, and to expose the means by which the treasury of the Patent Office has been robbed of thousands of dollars; and surprise is naturally expressed by the Committee that this Commission, appointed to investigate the complaints made by Commissioner Foote, could find no evidence of abuse and fraud on the part of the contractors.

It appears that, instead of giving the awards to the lowest bidder, as the law requires, the contracts were given to the highest bidder, by an ingenious system of modern arithmetic, which would put to confusion primitive Nathan Dabol, of New London, who was accustomed to figure out his sums and carry out an honest multiple. Take for example the bid of Dempsey & O'Toole:

100,000 sheets bond paper, per sheet	8
124 reams cap paper, best quality, per ream	20
12 gross barrel pens, per gross	3
10 dozen fine pencils, assorted colors, per dozen	3
Total	34

Coyle & Towers' bid:

100,000 sheets bond paper, per sheet	$0 02½
124 reams best cap, per ream	4 44
12 gross barrel pens, per gross	4 28
10 dozen pencils, assorted colors, per dozen	1 05
Total	$9 79½

Now, it is very plain from the arithmetic of Dempsey & O'Toole, as above given, that they were the lowest bidders, to the extent of $9·45½, but when the figures are fully carried forward, according to the multiplication table of Nathan Dabol, the gross sum of Dempsey & O'Toole's bid amounted to $8,024·66, while that of Coyle & Towers was but $3,112·42. Yet, strange as it may appear, the learned mathematicians in charge of the Patent Office, awarded the contract to Dempsey & O'Toole for the enormous sum of 34 cents fractional currency. The Committee state that another method has been to have a good understanding at the source of orders, and have them shaped for your benefit, calling for few if any goods where your bid is below cost, and for large orders where the profits are large; to be sure and have a large stock of all such ordered at the close of your contract, and change your bidding next time, going below cost where you have overstocked. The great reliance for profits, however, is in the purchases outside the contract schedule. All articles not in the schedule are charged at fabulous prices though the contract provides they shall be furnished at the lowest market rates. A few very pertinent examples of this genteel system of contact robbery are furnished as follows: "Forty-six caveat books have been charged and paid for since February, 1868, at $40 and $41 each, while not one of them can be found in the office. This is a book of printed forms, which could be of no use outside the office, as testified by all parties. 518,000 printed blanks, consisting of letters, decisions, etc., were charged and paid for, when less than 200,000 could be accounted for by the requirements of the office. Of file-wrappers, 80,000 were charged and paid for at a cost of $57 per 1,000, and after making liberal estimates for those used and on hand, 18,000 cannot be accounted for. Of manilla and large brown envelopes, nine by twelve, 145,000 were charged and paid for, while the quantity on hand and used could not exceed 40,000. Of cards for models, 150,000 were charged and paid for at $40 per thousand, while but 40,000 can be accounted for as used and on hand, leaving 110,000 unaccounted for. The above articles could be of no use anywhere but in the legitimate business of the Patent Office, as sworn to by all parties.

"Vast quantities of other articles cannot be accounted for in the office; but as they might have been made useful elsewhere, may have been purloined. We give a few cases of the many in evidence: Of eyelets, 1,820 boxes were paid for, but only 390 boxes would be required for the business of the office; four and a half dozen press copy books bought and paid for, but none to be found; 890 sheets French tracing paper bought, seldom if ever used, and but twelve sheets on hand; 121 reams yellow envelope paper bought, but not over 10½ reams can be accounted for; 1,006,000 envelopes paid for, while the uses of the office would amount to about 150,000. Of taffeta ribbon 10,100 pieces were paid for, and 1,999 gross of rubber bands; and there was a like extravagance in the other articles.

"The prices charged were as extravagant as the quantities. We give a few cases: Books worth $9 are charged at $45; cash books, worth $5, charged at $25; cards, worth about $3 per thousand, are charged at $40; printing envelopes, worth about $2·50 per thousand, are charged at $20 and $40; ruling, worth about $2·50 per thousand sheets, is charged at $50; printing 500,000 blanks, worth perhaps $2 per thousand, charged at $16·50 and $17."

The report states that these contractors have furnished 351,000 sheets of bond paper and been paid $28,080. Its highest testified cost was $7,020; add fifteen per cent for profit, $1,053, and you have $8,073. Deduct this from the amount paid and it leaves them over $20,000 above a fair profit on a bill of $28,080. Or, to state the transaction in a different way, $24,000 of this amount was advanced to the contractors for their business, which they were to cancel in paper at four times its cost, and this order is to pay them a further sum of $24,000 for what cost them $6,000.

We have not space for the full details printed in the Committee's valuable report, but enough is given to open the eyes of common understanding to the fact, that corruption of the worst forms have crept stealthily into the public service, and that the Patent Office has not been exempt. In view of this shameful exposure, who can wonder that the Patent Office has run $81,000 behind since July, 1867. Verily, in the inspired lamentations of Hosea: "Israel is an empty vine; he bringeth forth fruit unto himself." "The days of visitation are come; the days of recompense are come; Israel shall know it; the prophet is a fool; the spiritual man is mad, for the multitude of thine iniquity, and the great hatred."

Justice to Commissioner Foote requires us to state, that he has had nothing to do with making the contracts in question. On the contrary, the country owes him a debt of gratitude for his earnest efforts to expose and bring them to light.

HOW WORKINGMEN MAY OBTAIN FACILITIES FOR INTELLECTUAL IMPROVEMENT.

In a preceding article we have shown how *self-education* is possible to young men who, by reason of their employments, are prevented from availing themselves of the ordinary facilities afforded by the numerous institutions of learning scattered over the length and breadth of our free and happy land. In another article we have shown that by a systematic distribution of time, a margin of time could be rendered available for intellectual improvement to mechanics, except under extraordinary and exceptional circumstances. And we have promised to give in due time a synopsis of ways and means by which those engaged in manual labor might secure to themselves greater facilities than are commonly possessed by individuals of that class.

Books, implements, etc., may be beyond the means of a single individual, but an association can obtain them all. In this, as well as in all other things, association is the means of securing to each individual among many, privileges which are unattainable by each separately.

The facilities required are a suitable room, a well selected library, and special instruction on certain subjects. These are essential, but other collateral facilities for improvement may be secured, which will not only pay their own way, but aid very materially in paying for the essentials. We allude to popular lectures, not only upon technical subjects, but upon general topics interesting and attractive to all.

The possibilities here indicated will be perhaps more apparent by an illustration of how they have been already accomplished than by any other means. It was once our pleasure and good fortune to be instrumental in initiating such an association as we have described, and to see it succeed beyond all that was hoped for it at the outset. It was organized in a town of not more than four thousand inhabitants, among whom were about two hundred mechanics, mostly shoemakers, but there were also some machinists, carpenters, and bricklayers. Out of the two hundred, about fifty were found willing to subscribe to the terms of membership, and some twenty-five who were not mechanics also joined it. The entire fund, at two dollars per member, amounted at first to about one hundred and fifty dollars. With this fund a room was rented and a few books bought. The works first obtained were books of reference, and were not allowed to be taken from the reading-room of the association.

A prospectus of a lecture was advertised, and subscriptions from the citizens at large were obtained to an encouraging extent, attracted by the names of several first class popular lecturers. Circulars were printed and sent into neighboring towns, and one of the largest churches obtained for the lecture course. In no instance was there a failure to fill the church fairly at fifty cents per ticket, and the net profits of the course put the association in possession of sufficient funds to purchase a well selected library of two hundred volumes, including "The Encyclopedia Britannica," to carpet and furnish their room, and to pay for a course of lessons in mechanical drawing given to all the members of the association, who formed themselves into a class for the purpose, the drawing boards, paper, and instruments having been donated by a wealthy gentleman who had become quite enthusiastic over the success of the enterprise.

The second season was equally successful, but less money was expended in books, and more in instruction than the first season; and the number of members was greatly augmented, and the receipts consequently much larger. Our own connection with this association terminated shortly after the close of its second lecture course, but we have since learned that it is still prosperous.

We are far from saying that such success would be the rule, but that every association of the kind will succeed to a greater or less degree if judiciously managed we are thoroughly convinced. A selection of good lecturers upon popular scientific or literary subjects, at reasonable prices, can easily be obtained.

One of the principal things to be looked after in the commencement of such an association is to avoid expenditure for anything that is superfluous either in books or furniture. The books should be bought not for their amusing, but their instructive character. As funds become more ample, entertaining works of fiction of the best kind, and well selected poetry may be added, and will prove a source of income by the sale of library tickets to outsiders. History and biography should be added as circumstances may permit, but the first books should be those of reference and text-books, of which latter there should be no lack of duplicates.

We feel a deep interest in anything that tends to elevate the noble army of industrious mechanics, upon whom depend in so great a degree the continued prosperity of our common country; and we shall be happy to give all the information in our power that will aid in the diffusion of knowledge among them, and the establishment of such associations as we have described.

CHEMICAL INVENTION.

In looking over the large number of patent cases which pass through our office, we are impressed with the meager number of those relating to improvements in chemical processes. There is a wide field here, "white and ready for harvest," but the laborers are few. The earnest workers in the chemical field of discovery are, for the most part, professional men, who, having fixed incomes from the positions which they occupy, and apparatus and leisure for extended research, mostly devote their time in searching for new facts, rather than industrial applications of those already found. Notwithstanding this, many valuable chemical patents are taken out, and in some cases men have suddenly found wealth flowing into their coffers as the result of chemical discoveries which at first seemed of little value.

In other cases discoveries have been made which, patented, would have largely benefited the discoverer, as they have the world at large; yet have been suffered to pass into general and profitable use, while he, to whose labors such results are due, remains pecuniarily unrewarded.

Not only is the field a rich one, but its resources are constantly being augmented. The discovery of the method of manufacturing cheap oxygen, opens the door to improvement in many departments of chemical manufacture. Of course experiment can only show how such improvements can be made, but *possible* improvements, seem numerous. It appears to us that in the manufacture of acids, the preparation of oils for painting, the purification of oils, the manufacture of vinegar, etc., the use of uncombined and undiluted oxygen, may, in the future, be found to be preferable to its use as mixed with nitrogen in the atmosphere or combined in the salts of which it is a component.

Nothing illustrates the possibilities of chemical discovery better than the department of alloys. Here the combinations are absolutely infinite. Take up any work you can find upon the subject, and see how many of these combinations have been examined, and see further how many of those already examined are extensively used in the arts, and then calculate the chances of the successful discovery of other useful combinations. Let a man to-day invent an alloy that could be manufactured at a good profit, and substituted for brass, at three cents less per pound, and his patent for such an invention would be worth more than the product of any paying gold mine in the known world during its term.

We believe that a man who, first posting himself thoroughly upon the nature and chemistry of alloys, would set himself to a life-work of systematic experiment, recording the results of his experiments in tables, and preserving specimens of all alloys possessing any useful quality, and patenting such as prove applicable to special purposes, could not fail of success and fame.

What is true of alloys is also true of other chemical compounds and their applications. The patents issued for processes in the manufacture of substances having india-rubber as their chief constituent, form a class, the value of which has never been exceeded by any other, in proportion to the number of patents granted.

No greater amount of preparation is needed to enter upon chemical investigations than any other department of inven-

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tion embracing the fundamental principles of mechanics. It is true that men can invent mouse-traps who are ignorant of the laws of falling bodies, the nature of, and mode in which the radiant and undulatory forces act, and other principles of mechanical science. But such men do not invent electric telegraphs, or solar microscopes, or steam engines. To be a thorough mechanic requires study, as well as to be a thorough chemist; and we maintain that chemistry, as a science, is not difficult to ordinary minds. Few departments of science can be pursued more easily without instruction, and certainly no other affords more pleasure in its acquisition.

Here, then, is a field so wide that its full extent is scarcely appreciable, even to experts, with boundaries constantly enlarging, inviting all who seek either highest pleasure or profit to enter and work.

TRANSFUSION OF BLOOD.

The transfusion of blood, although it may have been practiced earlier than the 17th century, was somewhat extensively studied during a period ranging from 1657 to the close of that century. The principal experimenters during this period were Clark, Lower, Harwood, and King in England, Denys, Emmerez, Prévost, and Dumas in France, and Riva and Manfredi in Italy.

The operation consists in taking blood from the vessels of a human being or an animal and immediately injecting it into the circulatory system of another. The operation may be thus described: The subject into whose system the blood is to be transfused, has a slight opening made in a vein (if human the vein selected is generally in the left arm) sufficient to admit the insertion of a small tube. At the same time blood is taken from the veins of another subject, and being drawn into an appropriate syringe, is injected through the first mentioned tube into the veins of the former. Great care is necessary to avoid the injection of air bubbles or small clots. The operation must also be performed slowly, as otherwise a fatal shock may be given to an enfeebled patient.

The first experiments of which we have record were made upon dogs, or other domesticated animals of like species, but they were soon extended to transfusion of blood from an animal of one species into the veins of another of widely different species. Thus the blood of sheep was injected into the veins of dogs without apparent injury.

Denys and Emmerez were the first to attempt the operation upon a human subject. They publicly injected the blood of a sheep into the veins of an idiot upon two occasions. The first operation seemed to result in no injury. In fact it was thought that visible mental improvement was the result. The second, however, resulted fatally, the patient shortly becoming lethargic and dying in that condition. This took place in 1666. In 1667, one Arthur Coyn volunteered to submit to the same operation, and it was performed upon him twice by Lower and King. The first time ten ounces of sheep's blood were transfursed without apparent injury, but on the second trial unfavorable symptoms resulted. The same thing was done in Italy in 1668, but about that time Denys and Emmerez performed transfusion upon a young German Baron in Paris, who was afflicted with disease of the intestines, who shortly after died from resulting inflammation. This result occurred upon the second operation, the blood transfused being that of a calf.

The French government then proscribed the practice, and Pope also issued an edict of prohibition. Prof. Harwood, of Cambridge University, strove to bring this practice again into notice in 1785, and was followed by Dr. Blundell about the beginning of the present century, who with Prévost and Dumas, first enunciated the true principles upon which its successful application has been made. He showed that the organic differences in the blood of different species, could not but render admixture harmful, and confined the practice so far as human subjects were involved, to the transfusion of human blood solely. Blundell kept a dog alive for three weeks without food by transfusing into its jugular the blood of other dogs.

We recall these facts at this time because the practice seems to be coming more prominently into notice at the present time than it has been for some years past.

A German physiologist has latterly been making some experiments in transfusion from which, among others, he derives the following conclusions:

1. That the transfusion of blood taken from fevered animals produces fever.

2. The transfusion of small quantities of healthy blood (up to one-tenth of its entire bulk) produced no considerable increase of temperature.

3d. The transfusion of large quantities of healthy blood (one-fourth to three-fourths of the entire bulk) always caused a feverish elevation of temperature when a corresponding venesection had preceded the transfusion. The greater the interval between the two operations, the more considerable the elevation of temperature, but this never exceeded an increase of 1 deg. C.

The *Medical Record* also gives an account of a successful operation for the transfusion of blood recently performed by Dr. Enrico Albanese at the hospital of Palermo, Sicily. A youth aged seventeen, named Giuseppe Ginazzo, of Cinisi, was received at that establishment on the 29th of September last, with an extensive ulceration of the leg, which in the end rendered amputation necessary, the patient being very much emaciated and laboring under fever. The operation reduced him to a worse state than ever, and it became apparent that he was fast sinking, the pulse being imperceptible, the eyes dull, and the body cold. In this emergency Dr. Albanese had recourse to the transfusion of blood as the only remedy that had not yet been tried. Two assistants of the hospital offered to have their veins opened for the purpose, and thus at two different intervals, 220 grammes of blood were introduced into the patient's system. After the first time he recovered the faculty of speech, and stated that before he could neither see nor hear, but felt as if he were flying in the air. He is now in a fair state of recovery.

The operation has been performed also in cases of collapse from cholera with success, the patient in such cases becoming almost instantaneously warmer and exhibiting most marked relief. The evidences are then, on the whole, favorable to the operation when demanded by extreme cases, as it has no doubt in a number of instances snatched from the very jaws of death those who otherwise could not have recovered.

MODERN MUSICAL INSTRUMENTS.

A wide field of discovery and invention still remains unexplored in the department of musical instruments. It is well known that musicians make a distinction between those musical instruments which permit of perfect intonation and those which are "tempered" or modified in their intervals. The latter include organs, pianos, and melodeons. Such instruments are not, however, to be regarded as seriously defective on this account, although it would be desirable to so improve them that perfect intonation could be obtained. Indeed this has been attempted and with considerable success too, but for some reason the improved instruments have not enjoyed large popularity.

As a rule those instruments which are of the simplest construction, are the most perfect in tone, and at the same time most difficult to play; as examples we may mention the violin family, large and small, the base and tenor trombones, French horns, etc. The bugle group of instruments which comprises the opheclides, as well as the key bugle, are fine instruments and capable of very fine effects, both in tone and execution. But they are deficient in what musicians call *portamento* in singing, the gliding by insensible gradations from one tone to another; one of the most charming musical effects when delicately performed with the voice, violin, or trombone. This defect is common to all keyed instruments, if we except the flutes, upon which gliding from one tone to another can be partially attained by a skillful performer.

Valve instruments while they are equal in quality of tone to brass keyed instruments, are deficient in power of delicate execution, especially in rapid scale passages. The long distance through which the fingers have to move in order to work the valves, produces in a rapid passage more or less slubbering, according to the degree of skill possessed by the performer.

Notwithstanding this defect is added to the defects of the keyed instruments by the substitution of valves for keys upon brass instruments, valved horns have attained unprecedented popularity on account of the ease with which they may be learned. There is no doubt in our mind that a more efficacious device can be made for these instruments than the latest improved valves, one that will combine all the advantages of valves with none of their defects.

But, leaving the old beaten path, there are many bodies, capable of emitting under vibration the most beautiful sounds, that have never yet been practically utilized for instrumental purposes. Among these we may class glass, shells, and bars of wood and steel. Of all these rude and imperfect instruments have been made. Dr. Franklin's "armonica" was probably the most complete instrument ever constructed with glass It consisted of a nest of hemispherical glasses of different sizes, tuned and arranged on a revolving spindle impelled by a treadle, and the tips of the fingers being applied to the edges of the glasses produced the tones. It has always seemed to us that this instrument might be improved by the addition of a finger board and action, and developed into one which would not only have considerable power and facility of execution but also retain its marvelous sweetness of tone.

We have seen rude instruments made of steel bars suspended on frames which give peculiar orchestral effects. The well-known steel triangle is an instrument of very limited capacity. The bars of steel united at one end, used in music boxes, produce very pretty effects. The latter are the most perfect steel instruments yet devised.

We have seen instruments made of bars of wood laid upon wisps of straw and beaten with cork hammers like the dulcimer, which produced very good tones and permitted considerable execution by a skillful performer. One of these with a harp accompaniment, well performed, is worth listening to. We have seen oyster shells substituted for the wooden bars with good effect.

But to return to the instruments already in popular demand for parlor, street, and orchestra. There yet remains much to be done with many of them ere they can be said to fully meet all requirements. The piano should be made to sustain its tones longer especially in the upper part of its scale. The celebrated Ole Bull has attempted this improvement with only very partial success, if the critics are to be believed who heard its performances at that artist's recent concerts in this city. The melodeons, albeit improved so much during the past twenty years, that they are as far removed from the original instruments as man is from the ape, still admit of much improvement. Their tone is yet very much inferior to that of the pipe organ, and although they are extremely useful, and we may say in the present state of musical requirements almost indispensable, the tones of the reeds are still so inferior to those of pipes, as to warrant the prediction that large improvement is yet to be made in this family of instruments.

It is stated that a Parisian glassmanufacturer has produced glass threads, so flexible and tenacious that they have been used in sewing machines.

CHEESE AND NUTS.

Hall's Journal of Health has a few very sensible words on the use of cheese and nuts, which appear to tally, at least as regards the former, with some statements we made in our columns, pp. 61 and 62, No. 4, Vol. XVI. The editor says that if the nuts are ripe, and the cheese old (ripe), they both promote digestion. They should be eaten at the close of dinner. "The digesting agent in both is a peculiar oil which has the property of acting chemically on what has been eaten, and thus preparing it for being the more easily appropriated to the purposes of nutrition. Many think that the more solid portions of the nut should not be swallowed. This is an error; those particles of solid matter are not digested, it is true, but they are passed through the system unchanged, and act as a mechanical stimulant to the action of the internal organs, as white mustard seeds, swallowed whole, are known to do, thus preventing that constipated condition of the system which is so invariably productive of numerous bodily discomforts and dangerous and even fatal forms of disease."

It is well known that cheese is much more largely used in continental Europe, and in England, Wales, and Scotland than here. There it takes the place, in a measure, of the flesh food, so easily obtained here and so costly there. Here it is used mainly as a condiment or an appendage to the dessert of a meal; there it is the *piece du resistance* often of the laborer or hunter's meal. Judging from the use of it in our hotels and restaurants, one would suppose that it was a very costly production; it never being served unless specially ordered, and then appearing in the form and size of dice, a cube of half an inch square being served with a piece of pie or a plate of pudding, and always green or unripe cheese, with a texture like wax and a taste like fried shingles or toasted tallow. But cheese, as shown by its constituents and their proportions, is calculated to nourish and strengthen, not merely to tickle the palate. New cheese is, however, no more fit for eating than new bread. Both must be ripened, like natural fruit, before they are of any worth.

As to nuts, even the richest and most oily are valuable additions to our food. The chestnut (uncooked), the cocoa, the Brazil or Castile nut, and possibly others, do not digest readily but when roasted (not boiled) the chestnut, either domestic or Italian, is farinaceous, mealy, and nutritious. The cocoanut needs to be grated finely and united with some farinaceous substance as flour or meal. The Castile, or Brazilian nut, the walnut, hickory, or "shagbark," and English walnut are quite oily and unfit for an empty stomach, but as a means of digesting the food previously taken should not be despised.

In this connection it might not be amiss to speak of the improvement made in nuts by cultivation. In the valley of the Connecticut river, about the town of Glastenbury, Conn., there are orchards of walnut or hickory trees, as assiduously cultivated as any apple or peach orchard; the result is a very superior nut, large in size—often more than three inches in circumference—with very thin shell, and meat of unusual sweetness. In the Hartford market these nuts are known as "Glastenburys," and bring a high price. Chestnuts, our own indigenous product, are also improved by cultivation, until they equal in size the coarse Italian nut while preserving the sweet flavor of the wild or ordinary product.

Water-Glass, or Soluble Silicates.

Water-glass, or soluble silicate of soda, has come into use for a great variety of purposes. It is a most useful substance, and its nature should be better understood. We have recommended its use in the *Journal* for coating in the inside of water cisterns, to prevent the cement from acting upon the water. This is an excellent application. It may be made of great service in many ways, which our readers will understand from the nature of the article.

There are four kinds of soluble silicates, namely, *potash, soda, double, and clear.* The first is composed of 15 parts pulverized quartz (a pure sand), 10 of purified potash, and 1 of powdered charcoal. These substances are first well mixed and exposed to a strong heat in a glass melting-pot for five hours, until the whole fuses uniformly; the heat required being about the same as that which melts glass. It is now lifted out, and when cool, it is broken in pieces and dissolved in about five times its bulk of boiling water. It is kept boiling for about three hours before it is all dissolved, and water is added as evaporation proceeds, so as to keep up the original quantity. It now becomes slimy, and in that state, or more diluted, is fit for use in many operations. It should be placed in well-stoppered bottles for use.

The second silicate is composed of 45 lbs. of pure quartz, 23 of anhydrous carbonate of soda, and 3 of powdered charcoal. This is fused in the same manner as the other. By substituting anhydrous sulphate of soda for the carbonate of soda, and using about eight times more charcoal, a cheaper silicate is formed, and both are soluble by boiling in water. Rectified alcohol precipitates the potash silicate from its water, and converts it into a solid silicate, which is dissolvable in water. The potash and the soda silicates mix freely with one another.

The double-soluble silicate is composed of 100 parts quartz, 28 purified potash, 22 neutral anhydrous carbonate of soda, and 6 of powdered charcoal. This mixture fuses much easier than the other two, but three measures of the potash silicate and two of the soda silicate described, when mixed together, will answer for all practical applications.

The fourth silicate, which is applied to fixing the colors of pictures, is made by fusing 3 parts pure anhydrous carbonate of soda with 2 parts of powdered quartz, which is boiled as described for the other silicates. This is kept in a concentrated solution, and one measure added to four parts of concentrated potash silicate completely saturated with quartz. By this means, silica and an excess of alkali are obtained, which, al-

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though more soluble, is clear, and not rapidly decomposed. This soluble silicate should only be employed in stereochromy painting.

The first two soluble silicates, when mixed together, form an excellent cement with sand, and convert it into a stone-like mass. It is also excellent for filling up cracks in walls, as it acts very much like mineral glue.

When marble dust or chalk is made into a paste with water, then dried, and afterward saturated with the silicate, it forms a compact mass, and acquires a hardness little inferior to solid marble, and it is capable of taking a fine polish, and water will not soften it. A mixture of marble dust and the silicate of soda forms a cement which adheres either to wood or stone.

The oxide of zinc and soluble glass combine with great energy, and form a paste capable of being rolled out and made into sheets to cover substances, such as wood, with a coat resembling polished slate. A patent has been taken out for writing-slates made of this composition.

One of the most important applications of water-glass is to painting. It enables the colors to adhere, renders them almost indestructible, and is therefore calculated to supersede fresco-painting. Some splendid mural paintings in the museum at Berlin have been treated with the soluble silicate; they are stated to be splendid works of art, and far in advance of fresco painting for durability. Artificial sulphate of baryta, applied to glass by means of silicate of potash, imparts to it a milk-white color of great beauty; in a few days the silica is found intimately combined with it, and the color resists washing with warm water. By the action of strong heat, this silicious varnish is transformed into a white enamel. Blue ultramarine, oxide of chromium, and pulverized colored enamels may be applied. Silicious painting upon glass is destined to find advantageous employment in the construction of church windows; while silicious painting upon stone will serve for mural decoration.

The oxides and metallic salts which enter into the composition of silicious colors, or of cements, have the property, not only of combining with the silica of the silicates, but also of fixing, in an insoluble state, variable quantities of potash.

The colors which act most energetically in this respect are the ochres; oxide of manganese, oxide of zinc, oxide of lead, and artificial sulphate of baryta.—*Boston Journal of Chemistry.*

For the Scientific American.

"WASTE" AND "ECONOMY" OF FUEL.

NO. 1.

So much has been said and written on this highly important subject, that it may seem a superfluous task to attempt a further elucidation of it; but, as even at this late date many men, scientific and practical, differ materially in their appreciation of the causes and extent of loss of heat, both in the production of steam and in the arts and manufactures, we have thought that a short summary of the best ascertained and most recent facts in relation to this matter might prove valuable to many persons who have no spare time for study, and also to a large class of men, who, holding responsible positions such as managers, directors, or superintendents of steamboat lines, railroad companies, or of manufacturing establishments, have not received that preliminary tuition which would lead them to discover "waste of fuel" and the correctives to be applied to the same in their special cases.

Economy of fuel is of much more consequence than is generally realized, so much so indeed, that many companies whose shares ought to be paying splendid dividends, have proved unprofitable and ruinous investments, simply because of a waste of perhaps twenty or thirty per cent of coal, caused by the incapacity or negligence of some one man whose duty it ought to have been to prevent this loss. It is, especially in the case of ocean steam navigation and in metallurgical operations, carried on where fuel is expensive (as it is in many of our Western Territories), that many catastrophes attributable to this cause have been recorded.

Desiring in the following notes to be concise and practical, we commence with the enumeration of the principal *remediable* causes of waste of fuel in our steam engines, stationary, locomotive, and marine, all of which, notwithstanding their admirable recent improvements, are to be considered as very imperfect apparatus as regards their power of converting heat into motion.

The causes of waste depend either on the mode of working and treatment of the engine and boilers, or on the construction of the same. In the first category we class: 1. Inefficient stoking; 2. Blowing off or brine extraction; 3. Incrustations; 4. Urging of fires; 5. Leaks; 6. Carelessness before stopping; 7. Imperfect vacuum; 8. Radiation of heat; 9. Priming; 10. Use of bad coal, etc. In the second series we will enumerate: 1. Imperfections in the relative parts of the engine; 2. Defective boilers; 3. Misconstruction of fireplaces smoke boxes, flues, and chimneys, and their effects on combustion.

We shall now briefly review in succession these various sources of loss and state how best they can be remedied.

INEFFICIENT STOKING.

Every stoker who presents himself for hire, if his skin be only sufficiently thick, cracked, and carbonized, is supposed to be competent to take care of the fires of an engine; work of this nature being considered of the simple kind which any able-bodied man can properly perform without previous schooling.

This, however, is a radical mistake, as a really good and "careful" stoker, who thoroughly understands his business, is by no means common, and when found is always much valued by any competent engineer placed over him.

A change in stokers, has in very many instances been immediately followed by a reduction of as much as one quarter in the amount of fuel consumed, which proves that one of the first things to be investigated where "waste of fuel" is suspected, is into the competency of the man who has the actual handling of it.

An inefficient stoker will, independently of his extravagant use of coal, be very apt to cause damage to fire grates and boilers which will lead to their early destruction. Such a man ought to be discharged without any hesitation.

As, however, it is not always possible to obtain perfect help in this line, much may be done by watching and instructing such as are willing to learn. The principal rules to be followed in firing (the air being supposed to be properly introduced into the furnace), as given by the best authority on this subject, W. Wye Williams, C. E., are the following:

"1. Begin to charge the furnace at the bridge end, and keep firing to within a few inches of the dead plate.

"2. Never allow the fire to be so low before a fresh charge is thrown in that there shall not be at least four or five inches of clear, incandescent fuel on the bars, and equally spread over the whole.

"3. Keep the bars constantly and equally covered, particularly at the sides and bridge end, where the fuel burns away most rapidly.

"4. If the fuel burns unequally, or into holes, it must be leveled and the vacant spaces filled.

"5. The large coals must be broken into pieces not bigger than a man's fist.

"6. Where the ash-pit is shallow it must be frequently cleared out. A body of hot cinders overheat and burn the bars."

BLOWING OFF AND BRINE EXTRACTION.

The employment in boilers of salt, calcareous, or muddy waters, is the cause of a very considerable waste of fuel, as these various substances would soon form dangerous incrustations on the interior surfaces were they not eliminated before their deposition or solidification. The ordinary mode of doing this is by blowing off or "pumping out," a certain proportion of the hot water before its complete saturation and the cousequent formation of solid precipitates.

In the British navy one-half, or near that quantity, of the total amount of water is extracted from the boilers by means of brine pumps, and although this immense loss of heat is equivalent to nearly three-fourths of the whole consumption of fuel on the grates, it has been found that incrustations of variable thickness will invariably form after a voyage of a few weeks' duration.

In the French navy the blow-off is continuous, the water in the boilers being kept at 0·10 of total concentration, so that one-half pound is blown off for every one pound transformed into steam, or one-half pound is blown off for every one and one-half pounds of feed water, corresponding to three degrees (observed while hot) of the standard saturometer adopted by by the service.

In the Dutch navy the blow-off is effected by hand, periodically, according to the indications of the salinometer, care being taken to allow the water to rise three or four inches above its normal level in the boiler before opening the blow-off cocks.

The quantity of fuel wasted (that is heat lost) by "blowing off," varies according to the proportion of hot water extracted, the temperature of the same, and the heat of the feed water supplied to replace it. The theoretical figures given in relation to this subject vary considerably in various authors, according to their caloric estimate of one pound of coal and to the quantity of water blown off, relatively to the whole quantity consumed. These figures will be found in most manuals intended for the use of officers of the navy, and in many treatises on the steam engine. We shall, however, confine ourselves here to a purely practical mode of investigating the matter, and simply state that from careful long-continued experiments, under the management of experienced engineers and the direction of Mr. Thos. Halliday, one of the managers of the works of the celebrated marine-building firm of John Penn & Sons, of Greenwich, England, the results of which have been kindly communicated to us by a friend, the actual loss by blowing off under careful management, may be put down at thirty-three per cent of the total amount of fuel used. This is a rather startling figure but facts are stubborn witnesses, as is shown by Mr. Halliday's conclusions which we give in his own words:

"If we take" says he, "a marine steam engine of the most modern construction, with the ordinary condenser, by one of the best makers, and working with moderately superheated steam at a pressure of twenty to twenty-five pounds on the square inch, we obtain an indicated horse power by the consumption of from three and one-half to four pounds of good Welsh coals per hour. This would be the mean average of twelve months working.

"Now if we take an engine with surface condensers (also by one of our best makers), and also working steam moderately superheated, we obtain an indicated horse power by the consumption of two and one-fourth to two and three-fourth pounds of similar coals per hour. Therefore we may fairly estimate the loss of heat sustained by 'blowing off' of marine boilers to be equal to thirty-three per cent.

The generally received idea that the salts in sea-water or in water containing lime, only form sediments after the point of saturation has been reached, is proved by recent important researches to be fallacious.

In the case of bicarbonate of lime in the water, a comparatively low temperature will produce the elimination of the excess of carbonic acid which caused its solubility, and the consequence will be the deposition of crusts of insoluble carbonate of lime. Water containing gypsum, or sulphate of lime, according to the experiments of Mr. Cousté, will give up this earthy salt in a solid form when heated to about 302° Fah., equivalent to about 71 pounds of steam pressure on the square inch in the boiler.

In the same manner the whole of the salts contained in sea-water, may as first stated by Delacour (and irrespectively of the degree of saturation), be mechanically precipitated if the heat of the water be raised to 320° Fah., which will take place with a boiler pressure of about 94 pounds per square inch.

The above facts clearly show the causes of the great danger attending the use of high pressure boilers in connection with waters containing mineral salts in solution or suspension; even in presence of the best salinometers, brine pumps, blow-offs, or the most careful engineers.

The only way of avoiding the waste of heat caused by blowing off, is by using none but pure, clear, fresh water in the production of steam. This is practically effected by the employment of surface condensers, many different models of which are constructed. These surface condensers collect the steam escaping from the engines and cool it, until it resolves itself again into water which is run back into the boiler, so that the same fresh water used at the start, may be indefinitely reconverted into steam, allowance being simply made for leakage. Unfortunately, however, surface condensers are cumbrous, complicated, expensive, and liable to get out of order, so much so, indeed, that in many cases the saving of fuel has not compensated for the increased amount of repairs. Beside, the condensed water seems to have a rapidly-corroding action on iron and copper, which makes the question of durability of boilers and tubes a matter of very serious consideration.

Several substitutes for surface condensers have at different times been proposed, such as the use of special accessory boilers in which to collect the sediments, or the ingenious contrivance of E. Martin, for causing the deposition of all impurities on perforated plates by the action of superheated steam on the feed water, but all of these have practically been found wanting in some respect or other. A really good surface condenser, or a substitute for it, is to this day a desideratum which urgently claims the prompt attention of inventors.

Editorial Summary.

THAT DOLLAR MUSIC BOX.—Our attention has been called to an advertisement under the above caption which recently appeared in the SCIENTIFIC AMERICAN, and a correspondent has sent us one of the boxes. It is simply a poorly made mouth harmonicon constructed of tin and wood, and affords music about equal to that which can be produced by applying a piece of paper to a comb, and singing through it. The instrument would amuse a small child for a few minutes, and is worth to those who want so poor a thing about five cents. In other words, the thing is a swindle, and the parties who sell it are swindlers, who have no right outside the penitentiary. We do not intend to admit such advertisements into our columns, but they get into the office through advertising agents; and in spite of all the precaution which we endeavor to observe in the matter, our clerks either thoughtlessly or stupidly take in some which would have been refused admittance had they been previously brought to our notice. Now we put it to those of our readers who have been deceived by this advertisement, does not "swindle" appear upon its very face? and is there not something so very absurd in the thought that a music box can be bought for one dollar, to play eight select tunes, that you are astonished at yourselves, for nibbling at the bait? We recommend all who want cheap music in choice variety to purchase a Jews-harp, upon which a hundred tunes may be executed, if one only knows how to breathe forth sweet sounds.

PATENT OFFICE FRAUDS.—Upon another page we present a startling array of figures which show how the treasury of the Patent Office has been fradulently depleted of many thousands of dollars—paid in by honest inventors. The report has since come up in the House, and the Committee were called upon to fix the responsibility upon the shoulders of the officials guilty of these corrupt practices. The Committee seemed afraid to speak out, however, and the public are left to conjecture who the parties are. Thus the affair is partially glossed over, and nobody is to be held accountable for a swindle which, in any country where honesty was the rule, would consign the perpetrators inside the walls of a prison. If Congressmen were clean-handed themselves, they could go about these investigations with a determination to expose and punish those who are guilty of these glaring frauds.

NEW YORK CITY ELEVATED RAILWAY.—The new propelling machinery has lately been put in operation and a passenger car run on the first half mile section, in Greenwich street, between the Battery and Cortlandt street, New York city. The car is moved by means of a small wire rope, or cable, which as at present arranged seems to work easily. We understand that the Company is perfectly satisfied with the machinery. We lately took a ride on the road, and everything seemed to operate well. The cable is supported upon little trucks or dogs, which run upon small tracks in the center of the main track. Connection is made between the car and cable by means of a rock shaft on the car, which comes in contact with the dogs. A series of springs on the bottom of the car prevent any sudden shock when the car is put into connection with the cable. The car may be connected or disconnected at will by simply moving the rock shaft. The car wheels are of wood, and the vehicle makes but little noise. The track is supported on pillars, rising from the sidewalk, sixteen feet high.

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STEAM PUMP VALVES.

IMPORTANT DECISION UNDER THE PATENT LAWS.

An important action at law has just been decided by Judge Blatchford in the United States Circuit Court for the Southern District of New York. The patent in question was that of Peter Poillon. The substance of which was the discovery by a Mr. Gale (the assignor of Mr. Poillon), that if one of two contiguous moving surfaces in steam machinery, such as the face of the piston, as it moves in the cylinder, was cut with a series of fine grooves, that steam, when introduced between the two surfaces and into the grooves, would pack itself, although the two surfaces were not in actual contact, obviating the necessity of springs or other frictional packing. The patent is an old one, but has never before been brought to final hearing before the courts, though numerous actions have been instituted against, and settled by infringers.

The infringement complained of was the use by the defendant, Joseph Schidt, one of the firm known as the Lion Brewery, of two of the direct-acting steam pumps, made by the late firm of Campbell & Hardick, now Charles B. Hardick, which it was alleged infringed upon Mr. Poillon's patent by a substantially similar device in the steam slide valve connecting with the main cylinder.

The principal defence was want of novelty in the invention, by reason of the publication in a German work, known as the "Schauplatz," printed at Weimar in 1847, in which was described and delineated with great particularity a piston said to have been used by a Mr. Cavé, having its surface grooved in precisely the same manner as the Poillon piston, but which was only used by Mr. Cavé in connection with air in an air blower.

The point in question, therefore, was whether the grooved surfaces, having been before used in connection with air, and for the purposes of developing the property in air of becoming self-packing in such an apparatus there was any patentable novelty in the employment of the same grooved surfaces to develop a similar property in steam.

Judge Blatchford has decided that the invention is both novel, useful, and highly meritorious; is not defeated by the "Schauplatz" publication; and that the pumps used by the defendant are an infringement, and that he must respond in damages to the amount of the license fee.

The following extracts from the opinion of the learned Judge show the ground of the decision:

Blatchford, J. . . . . "The invention, as set forth in the specification, is a highly meritorious and useful one, and one which a court will desire to sustain, if consistent with the principles of law. . . It is a claim for a process; it is not a claim to the grooved surfaces in themselves. Gale, undoubtedly, was the first to discover that steam could be made to pack itself, and that it could be made to do so, by causing it to act, in the way described, in one or more grooves. . . The grooves, used in an air engine, were indeed old, but it by no means follows because air would work successfully in the apparatus of Cavé, that steam could be made to pack itself. . . . .

"It by no means detracts from the novelty or patentability of the invention, that in carrying it into practice, the use of grooves like those in Cavé's apparatus was found beneficial." . . . .

Frederic H. Betts for Plaintiff.
S. D. Cozzens, Esq., for the Defendant.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

Extensive steel works are in progress of construction at Bridgeport, Conn., and the Williams Silk Factory is to be converted into a manufactory of hats.

An American gentleman writes from London that common American corn cobs are sold in the streets of that city as, "Patent fire lighters—eight for a penny."

A firm in Alton, N. H., have recently concluded a contract to make fifteen million spools. It is estimated that one thousand cords of birch wood will be required to fill the contract.

The Albany and Susquehanna Railroad is now in full running operation from Albany to Binghamton, and three trains are running each way daily.

The value of the iron product of Marquette county, Michigan, on the shore of Lake Superior, during the year 1868, amounted to nearly four millions of dollars.

The Bennington and Rutland Railroad company have leased the Lebanon Springs road and will hereafter run in close connection with the Harlem Road.

Copper mining in Michigan employs a capital of fifty million dollars and about forty thousand workmen.

A clock manufactory at New Haven made last year 200,000 movements and 140,000 cases.

The cotton crop of Texas will be this year 240,000 bales worth, $18,000,000 in gold.

A large soap factory has been recently put in operation at San Antonio, Texas.

The first cotton mill built in New England was at Putnam, Conn,

Philadelphia claims the largest umbrella factory in the world.

NEW PUBLICATIONS.

THE WATCH. H. F. Piaget, New York.

This little volume has reached its third edition, and the demand for it, the author informs us, is constantly increasing.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

CHURNS.—G. A. Dabney, San Jose, Cal.—This invention has for its object to furnish an improved churn, which shall be simple in construction and efficient in operation, performing its work rapidly, thoroughly, and with the greatest ease to the operator.

COMBINED SEED PLANTER AND PLOW.—E. Seibel, Wittenburg, Mo.—This invention has for its object to furnish an improved machine for attachment to plows, by means of which the seed may be planted as the furrow is opened by the plow, which shall be so constructed as to operate automatically, dropping the seed wherever the plow can go, being thus especially adapted for use in new, stumpy, or rough ground.

GANG PLOWS.—Joseph Totten, Adams, Ill.—This invention has for its object to furnish an improved gang plow, which shall be so constructed and arranged as to do its work better, more accurately, and with less strain upon the horses than when constructed in the ordinary manner, and which shall, at the same time, be easily adjusted to cut furrows of different widths and of different depths as may be desired.

SHEET METAL COOKING UTENSILS.—S. P. Loomis, Philadelphia, Pa.—This invention has for its object to improve the construction of saucepans, bake-pans, and other sheet-metal cooking utensils, in such a way that the vessels so constructed may wholly prevent the scorching or burning of the substance being boiled, stewed, baked, or otherwise cooked.

SELF-FEEDING CHERRY PITTER.—Wesley C. Barr, Macon City, Mo.—This invention has for its object to furnish an improved self-feeding cherry pitter, which shall be simple in construction and reliable in use, doing its work quickly and well.

POST-HOLE DIGGER.—S. C. Horton, Tarrytown, N. Y.—This invention has for its object to furnish an improved post-hole digger, which shall be simple in construction and effective in operation, doing its work quickly and well.

SCHOOL DESKS.—John Peard, New York city.—This invention has for its object to furnish an improved school desk, which shall be strong, convenient, and so constructed that the desk and seat boards, either or both, can folded up out of the way, or the desk board be turned up to serve as an easel.

POTATO PLANTER, CULTIVATOR, AND DIGGER.—Chas. J. C. Petersen, Portchester, N. Y.—This invention relates to a new agricultural implement, which can be used for planting, cultivating, and digging potatoes, also for planting and cultivating corn and other seed. The whole apparatus is so constructed that it can be readily converted from a planter to a cultivator or digger, and *vice versa*.

WOODWORTH PLANING MACHINE.—John B. Schenck, Matteawan, N. Y.—This invention relates to new and useful improvements in that class of planers known as "Woodworth Planer," whereby they are made much more convenient and useful than they have hitherto been, and the invention consists in providing suitable mechanism for the simultaneous adjustment or graduation of the top feed rolls; the method of graduating the facing cutter and pressure bars in combination with the simultaneous graduation of the upper feed rolls by a single screw on each side of the machine; and also in the combination of levers, stirrups, and saddles by which the feed rolls and pressure bars or rolls (either may be used) are weighted.

WOODWORTH PLANERS.—John B. Schenck, Matteawan, N. Y.—This invention relates to new and useful improvements in the machines known as "Woodworth Planers," whereby they are made much more convenient and useful than they have hitherto been, and the invention consists in providing suitable mechanism for moving simultaneously the guides and matching head across the machine, and preserving their relative positions; also in the arrangement for adjusting the weight on the pressure bar, or roll, so that it shall bear directly over the lumber, and thereby prevent the roll or bar from canting, and causing it to press equally on the surface of the lumber.

HAY RAKER AND LOADER.—James Armstrong and John Jeffcoat, Onawa, Iowa.—This invention relates to a new apparatus for raking and stacking or loading hay, and is so arranged that it cannot be injured by careless operators, and which is easily operated by a team or other motive power. It operates entirely automatically, and can stack hay about as quick as the same could heretofore be cocked.

PLOW ATTACHMENT.—A. E. Cruttenden, Canasaraga, N. Y.—This invention relates to improvements in plowing apparatus, and consists of an adjustable attachment to be applied to the beams of common plows for guiding them, regulating their depth of cutting, and for guiding the plane of the plows when working on side hills.

BURIAL CASES.—Jasper R. Hathaway, Westfield, N. Y.—This invention relates to the construction of burial cases or coffins, and has more particular reference to improvements on a burial case, for which Letters Patent of the United States have already been received.

CHURN.—Joseph Alexander, Gallipolis, Ohio.—This invention relates to a new and improved churn constructed and arranged in such a manner that butter may be produced from the cream in a comparatively short time and air incorporated with the cream during the process of churning.

BEEHIVE.—Jesse Pearson, West Milton, Ohio.—This invention relates to a new and improved beehive, and it consists in the peculiar construction of the same, whereby perfect ventilation is obtained and bee moth excluded, and the multiplication of colonies readily effected.

MEDICAL COMPOUND.—S. W. Ingraham, M. D., Wooster, Ohio.—This invention relates to a new and valuable remedy for various diseases, composed of various substances, each possessing healing virtues in itself, but being combined, as hereinafter described, form a compound which is designated the "Magic Macedonian Oil."

HARNESS PAD.—Charles Drew, Newark, N. J.—This invention consists, in general terms, in substituting the usual hair or moss stuffing, by a pad of vulcanized rubber, which is covered with leather and united to the back plate by the screw shank of the rein rings and auxiliary screws in the usual manner.

COFFEE MILL FASTENER.—Johann Winkler, Hudson City, N. J.—The object of this invention is to produce an apparatus for fastening coffee mills to the tables, so that they need not be held while being used. The invention consists in the use of an attachment, which is made in form of a curved or U-shaped downward projecting arm, provided with a thumbscrew, by means of which the coffee mill can be clamped to the table.

HYDRANT AND STREET WASHER.—James J. Smith and Samuel Wood, Cleveland, Ohio.—This invention relates to new and useful improvements in hydrants and street washers for street water "mains," whereby they are rendered more efficient, convenient, and simple than they have hitherto been.

AIR HEATER.—Adam Cant, Galt, C. W.—This invention relates to an improved arrangement for heating air for warming buildings, or other purposes, and it consists in providing a series of flat flues through which the air to be heated is made to pass.

KINDLING BLOCK.—William Loft, Bergin City, N. J.—This invention relates to a new manner of connecting pieces of kindling wood into blocks, so that they may form cases for containing combustible material. These blocks should be so connected that they can be shifted from a rectangular into lozenge form to fit any stove.

MEDICAL BEVERAGE.—W. W. Timmons, Rahway, N. J.—This invention relates to sirup used with water in compounding beverage fluids, and consists in the combination of water, sugar, soda, or other suitable alkaline matter with albuminum matter, as the whites of eggs, flour, and citrate of magnesia.

STEPS FOR SPINDLES.—Wm. P. Hopkins, Lawrence, Mass.—This invention relates to improvements in steps for spindles, whereby it is designed to provide a more reliable and improved means of lubricating the spindles.

SASH FASTENER.—Cornelius H. Cain, Fremont, Ohio.—This invention relates to improvements in sash fasteners, whereby it is designed provide an improved arrangement of self-fastening device, to be released for moving the sash in either direction, by pressing thereon in the direction it is desired to move the sash.

BELT PUNCH.—John P. Jubb, Namaha, Mich.—This invention relates to improvements in punches for punching belts, and other similar articles, the object of which is to provide a convenient arrangement whereby the punching may be effected by the blow of a hammer delivered upon a solid punch, which is also applicable for punching out old rivets.

MILK KETTLE.—Hermann Friedlander, New York city.—The object of this invention is to prevent milk from boiling over and from creating the consequent very disagreeable odor. The invention consists in the application of a weighted cover, from which a tube having a spout at its upper end projects upward. The kettle is covered, and if the milk should boil over it can only rise in the tube and flow from the spout down upon the cover, whence it flows through an aperture of the cover back to the kettle again.

MACHINE FOR DRESSING BARREL STAVES.—Peter Stricker, and James Lefeber, Cambridge City, Ind.—The object of this invention is to provide an improved machine for giving the proper inside curve to staves for all kinds of stave vessels requiring curved staves, and though it is more particularly designed for this use, and though it is more particularly designed for this use, is also applicable to the cutting such concave or convex profiles on strips for which it may be arranged.

BOX FOR LOCOMOTIVE DRIVING AXLES.—Jos. W. Golf, Providence, R. I.—This invention relates to improvements in the construction of journal boxes for the driving axles of locomotives, whereby it is designed to provide an arrangement that will be less liable to wear and become slack in the sides, and admit of more readily taking up the slack occasioned on the sides of the boxes by the pounding thereon of the axle under the action of the cranks, and also admits of effecting the said adjustment, or the removal of the box entirely from the axle and the housings, with greater facility than can be done with those as at present constructed.

HANDLES FOR TEAPOTS AND OTHER METALLIC TABLEWARE.—Edmund W. Porter, Taunton, Mass.—This invention relates to improvements in handles for tea and coffee pots, and other metallic articles of tableware, whereby it is designed to provide non-heat conducting handles at less expense and of better heat-resisting qualities than those now in use, and to apply them in a manner to admit them to be readily detached when required for plating, cleaning, etc.

PLATFORM FOR CARRIAGES, ETC.—John Heiden, New York city.—This invention relates to improvements in the construction of the front gear of carriages or other vehicles, having for its object to provide an arrangement whereby the same may be made lighter, cheaper, and stronger, than as at present constructed.

LOCOMOTIVE AND OTHER BOILERS.—John S. Mullin, Newark, N. J.—This invention relates to new and useful improvements in steam boilers for locomotive and other engines; and it consists in providing means for consuming the sparks and gases generated during the combustion of the fuel, by forcing the products of combustion from the smoke chamber or base of the chimney, back to the firebox in combination with atmospheric air. It also consists in means provided for supplying the fire with air by other means and in a perforated adjustible diaphragm beneath the grate bars, and in an air chamber around the smoke chamber, supplied with air by a blower attached to the boiler.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1 00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

H. H. K., of Mass.—To extinguish a kerosene lamp safely turn the wick down until the flame is low and blow under the glass. If turned down until almost out, blowing in the top of the chimney is said not to be dangerous. Horse powers are so common and of so many different forms that we could hardly designate any particular one. None, however, is more generally and acceptably used than that where the animal travels an inclined, endless track, too common to require more than a mention.

N. and H., of Conn., desire to know the address of the maker of the annular (diamond) drill such as is now used in drilling at Hell Gate. We saw it at work in Titusville, Pa., boring for oil through solid rock, in 1865, but do not know the name of the maker. Some of our readers may answer this question.

T. K., of Mich., propounds the following: Suppose a pound weight will just bring down a spiral spring six inches in hight, how many pounds will be required to bring down eight spiral springs each six inches in hight, each spring being separated from the other, not counting anything for the weight of the springs, and they being placed one upon the other?" The separation of the springs and the placing of one upon the other seem to present a contradiction. But, in any view, a satisfactory reply to the question can be obtained only by experiment. The laws governing the action of springs are not sufficiently defined to construct a reliable theory. If the end sought is expected to be of practical benefit the simple experiment is warranted.

R. G., of Mich., and T. B., of Pa.—The reply to "M. S. W." page 55 current Vol., is erroneous in so far as the square inches were not taken into consideration. The question, as understood, was the relative downward pressure of columns of water of varying diameters. It is evident that if the relative pressure to the square inch is considered, the aggregate amount of pressure coincides with the number of square inches exposed.

W. G. W., of Ala.—The reaction of water in an Archimedes screw, will cause it to rotate if left to itself and a supply be given to it at the top. We do not think the combination you suggest, would be valuable.

J. O. B., of Ala.—We do not know where air-guns can be purchased in this city. You could probably find out by advertising in our paper.

G. J., of Me.—Lead melts at 630 deg. Fah., but melted lead may attain a much higher temperature.

H. G., of Fla.—All that is necessary to convert oyster shells into excellent lime is to burn them, that is to heat them until the carbonate of lime which constitutes their bulk is decomposed and the carbonic acid gas expelled. A line or two in our paper under the head of "Business and Personal" will probably put you in communication with the parties interested in the sale of patent lime kilns.

L. W., of Me.—The problem you send us is either wrongly enunciated, or involves an absurdity. A body may revolve around another body, or two bodies may revolve around a fixed or moving point in space, but it is absurd to speak about two bodies revolving at the same time around each other. If you mean that two bodies are revolving around a common moving center, the data are still defective. Their paths cannot be determined without the radii of revolution as well as their velocities.

J. G. S., of Pa.—The less the pressure under which gas is discharged through a meter, the more cubic feet will be required for the same amount of light, all other things being equal. Partially stopping of the inlet pipe, as it reduces the pressure, is therefore only putting money in the pockets of the gas companies. This fact is well known and has often been made the subject of accurate experiment. In fact it has been made the subject of legislation in foreign countries, and we think in some of the United States, gas companies being required by law to deliver their gas under a given pressure.

N. R., of N. Y.—A very good cement may be made by melting together in an iron dish, equal parts of gutta percha and common pitch, and when well stirred pouring the mass into cold water. This becomes perfectly fluid at a temperature of 100 degrees. It is a useful cement for many purposes. A still stronger cement, for leather and cloth, is made of 1 lb. gutta-percha, 4 oz. india-rubber, 2 oz. pitch, 1 oz. shellac, and 2 oz. of fine sperm oil. The ingredients are to be melted and thoroughly stirred together. The cement is to be used hot.

G. H. D., of N. Y.—The smooth side of the belt is the best to put next the pulley.

C. D., of Ohio.—There is no patent on the toy steam engine, about which you inquire.

W. M., of Pa.—The water on an overshot wheel, should be applied as near to the summit of the wheel as possible. The processes for making self-raising flour are usually patented.

S. A. O., of N. Y.—It is said that soaking plaster casts in a thin and warm solution of glue will, after they become dry, render them quite hard and tough. Silicate of soda or better the double silicate of soda and potassa, will also give them greater consistency.

J. O. S., of N. Y.—The consideration of the size of driving wheels is not alone sufficient to determine the tractive power of an engine. Large driving wheels are used when great speed is desired, and when a proper adjustment of other parts is made they answer the purpose designed.

W. Y., of N. Y.—A gold colored lacquer is made by taking seed lac 3 ozs, tumeric 1 oz., dragons blood ¼ oz., and digesting them for a week in one pint of alcohol, shaking often and finally pouring off and straining the solution.

S. K., of Mass.—To dress a solid rubber and emery wheel when it gets out of true or becomes glazed, heat a block of iron of considerable size quite hot, and place it near the edge of the wheel while it is

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in motion. At the same time using an old file or its equivalent as a turning tool you can by working upon the opposite side soon true up your wheel and remove the glaze.

M. S. G., of N. Y., asks how to "figure out the gears on a lathe to cut two, three or four threaded screw and how to measure or count them." He has found out from the SCIENTIFIC AMERICAN how to arrange for single threaded screws. There is no difference between the arrangement of gears for cutting double, triple, or quadruple threads and that for single threads. The face plate of the lathe must be divided into as many equal parts as there are to be threads, and the tool set out by each mark in succession. In counting multi-threaded screws there is no difficulty. The number of the threads may be seen by looking at their terminals on the end of a screw, and then, laying the rule on the screw, counting one for each of the series; Thus a three threaded screw should be counted one for every three threads, etc.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Ellis' blind-slat tenoning machine wanted. Must be in good order. Address Box 230, New Britain, Conn.

Sites and valuable water power may be secured at Brewster's, N. Y., junction of N. Y. and Montreal, and Boston and Erie R. R. lines. Address Samuel W. Marvin, 33 Mercer st., New York.

For sale on account of ill-health—a well-established saw factory. Or, to an energetic, practical man, would prefer to sell an interest. Address "L. S. W.," Clarendon Hotel, New York city.

Two saw mills for sale. C. Bridgman, St. Cloud, Minn.

Inventors' and Manufacturers' Gazette—February number enlarged to 16 pages. The cheapest paper in the world. $1 per year. Published at 37 Park Row. Postoffice box 448, New York City.

Wanted—A first-rate bone mill. Send price and description to to S. Emlen, 627 Market st., Philadelphia.

Rockwood, 839 Broadway, N. Y., photographs architectural or mechanical drawings and plans to a scale. Also, photographs of machinery.

Wanted—New or second-hand caloric engine, 4 to 8-H. P. Also, engine lathe and iron planer, medium size. Address W. H. Locke, Canton, Pa., giving description and cash price.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Scientific Purchasing Agency.—Scientific, Mechanical, Mining, and Agricultural Books, Instruments, etc., for sale at publishers' or manufacturers' prices. Address Saltiel & Co., Postoffice Box 448, New York city, or 37 Park Row.

Change Gear-wheel Tables.—See Walter & Son's advertisement.

Manufacturers and dealers in agricultural implements are requested to send their addresses to W. T. Jaquith, Allegheny City, Pa.

Wanted—To correspond with a practical sheet-iron galvanizer. Also, with manufacturers of washer machines to make washer at one revolution. J. W. Britton, Cleveland, Ohio.

Manufacturers of improved barrel machines please address Philadelphia Postoffice Box 2476.

Manufacturers of fancy articles of furniture send address to E. F. Gilbert, Lyons, N. Y.

Punching and shearing machines. Doty Manufacturing Co., Janesville, Wis.

Specialties in the Machinists' line. Parties desiring work of a special character address S. W. Gardiner, 6 Alling st., Newark, N. J.

"The greatest attraction in the Mechanics' Hall, at the New York State Fair, was the wonderful scroll saw exhibited by J. W. Mount." —See New York Times, Oct. 16, 1868. All who are interested in scroll saws should address the exhibitor at Medina Iron Works Medina, N. Y.

Wanted—one No. 1 Dicks' patent punch. Address Marvin & Co., 265 Broadway.

The Watch—history, construction, and third edition. Illustrated and improved, neatly bound. Price 50 cents. Address the author, H. F. Piaget, watch repairer, 119 Fulton st., New York.

Ericsson's Caloric Engines.—Where a light, safe, economical power is required, these engines—of late greatly improved in construction as well as reduced in price—answer an admirable purpose. Apply to James A. Robinson, 164 Duane st., New York.

Scientific American.—Old and scarce numbers, volumes, and entire sets of the Scientific American for sale at the Scientific Purchasing Agency, 37 Park Row, New York. Postoffice box 448.

Ask for Olmsted's oiler,—the best made. Sold everywhere.

The manufacture and introduction of sheet and cast metal small wares is made a specialty by J. H. White, of Newark, N. J.

For descriptive circular of the best grate bar in use, address Hutchinson & Laurence, No. 8 Dey st., New York.

An experienced engineer, who for years has been engaged as superintendent and mechanical draftsman n a machine shop, wishes a similar position in some establishment. Good references given. Address Engineer, Postoffice Box 3443, Boston, Mass.

American Needle Company, general needle manufacturers, and dealers in sewing-machine materials. Hackle, gill, comb, card pins, etc., to order J. W. Bartlett, Depot 569 Broadway, New York.

Responsible and practical engineers pronounce the Tupper Grate Bar the best in use. Send for a pamphlet. L. B. Tupper, 120 West st., N.Y.

Iron.—W. D. McGowan, iron broker, 73 Water st., Pittsburgh, Pa.

For sale—100-horse beam engine. Also, milling and edging machines. E. Whitney, New Haven, Conn.

N. C. Stiles' pat. punching and drop presses, Middletown, Ct.

Winans' boiler powder, N. Y., removes and prevents incrustations without injury or foaming; 12 years in use. Beware of imitations.

The paper that meets the eye of all the leading manufacturers throughout the United States—The Boston Bulletin. $4 a year.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING FEBRUARY 2, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On filing each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On filing application for Design (three and a half years)	$10
On filling application for Design (seven years)	$15
On filling application for design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

Patents and Patent Claims.—*The number of patents issued weekly having become so great, with a probability of a continual increase, has decided us to publish, in future, other and more interesting matter in place of the Claims. The Claims have occupied from three to four pages a week, and are believed to be of interest to only a comparative few of our readers. The publication of the names of patentees, and title of their inventions, will be continued; and, also, as heretofore, a brief description of the most important inventions. We have made such arrangements that we are not only prepared to furnish copies of Claims, but full Specifications at the annexed prices:*

For copy of Claim of any Patent issued within 30 years **$1**

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from **$1**

upward, but usually at the price above named.

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them ..... **$1·25**

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, No. **37** *Park Row, New York.*

86,341.—STEAM-GENERATOR SAFETY VALVE.—John Absterdam, New York city.

86,342.—FLY SCREEN FOR ANIMALS.—Benjamin F. Adams, Forest Hill, Bangor, Me.

86,343.—CHURN.—Joseph Alexander, Gallipolis, Ohio.

86,344.—SOFA BEDSTEAD.—John J. Anderson, Boston, Mass.

86,345.—HAY-RAKER AND LOADER.—James Armstrong and John Jeffcoat, Onawa, Iowa.

86,346.—STEAM SAFETY VALVE.—John Ashcroft, New York city.

86,347.—MANUFACTURE OF TIN-LINED LEAD PIPE.—Harvey J. Bailey, Pittsburgh, Pa.

86,348.—CARRIAGE SPRING.—John Balbach, San Jose, Cal.

86,349.—CHERRY PITTER.—Wesley C. Barr, Macon City, Mo.

86,350.—STEAM DRYER.—Geo. S. Barton (assignor to Rice, Barton, and Fales Machine and Iron Company), Worcester, Mass.

86,351.—MOP AND SCRUBBER COMBINED.—E. S. Bennett, assignor to himself, M. B. Boardman, and Jotham W. Hawxhurst), New York city.

86,352.—DEVICE FOR GRINDING TOOLS.— Stewart Bennett, Wilkesbarre, Pa.

86,353.—PINCHERS, NAIL MAKER, AND DRIVER FOR LASTING BOOTS.—Lyman Reed Blake, Boston, Mass.

86,354.—GRAIN DRILL ATTACHMENT.— Samuel Bowman, Camp Hill, Pa.

86,355.—COMPOSITION FOR ROOFING.—J. Warren Brown, Washington, D. C.

86,356.—CONSTRUCTION OF FIRE-PROOF SAFES.—H. H. Bryant, Boston, Mass. Antedated Jan. 25, 1869.

86,357.—STAIR ROD.—H. J. Burr, Bloomfield, Conn., assignor to himself and W. E. Simonds.

86,358.—CIRCULAR SAW MILL.—V. H. Buschmann, Baltimore, Md. Antedated Jan. 20, 1869.

86,359.—SASH FASTENER.—C. H. Cain, Fremont, Ohio.

86,360.—FIRE EXTINGUISHING APPARATUS FOR VESSELS.—V. E. Campbell, Sterling Center, N. Y.

86,361.—DIE FOR FORGING WRENCH HEADS.—A. B. Candee, Hamden, and L. S. Taylor, Unionville, Conn.

86,362.—STOVEPIPE DRUM.—Adam Cant (assignor to himself and Hugh Cant), Galt, Canada.

86,363.—BRICK KILN.—Peter Clark, Brooklyn, N. Y. Antedated Jan. 16, 1869.

86,364.—HOLLOW AUGER.—Wm. A. Clark, Woodbridge, Ct.

86,365.—OPERATING SHUTTLE-BOXES IN LOOMS.— Timothy Cleary, Millbury, Mass.

86,366.—HORSE RAKE.—Lyman Clinton, North Haven, Conn.

86,367.—SCYTHE SNATH.—T. S. Coffin, Harrington, Me.

86,368.—MANUFACTURE OF TOBACCO PAPER.—P. M. Consuegra and Ramon Antiguedad, New York city.

86,369.—TOBACCO PAPER.—P. M. Consuegra and Ramon Antiguedad, New York city.

86,370.—PLOW ATTACHMENT.—A. E. Cruttenden, Canasaraga, N. Y.

86,371.—CHURN.—G. A. Dabney, San Jose, Cal.

86,372.—AUTOMATIC FEED-WATER DEVICE FOR BOILERS.—J. A. Davis, Watertown, N. Y.

86,373.—STEAM GENERATOR.—J. A. Davis, Watertown, N. Y.

86,374.—SKATING RINK.—Wm. Dennison, Cambridge, Mass.

86,375.—HARVESTER.—S. P. Doane (assignor to himself and Leonard Treadwell), San Francisco, Cal.

86,376.—HARNESS PAD.—Chas. Drew, Newark, N. J.

86,377.—PADLOCK.—Fred. Egge, Bridgeport, Conn.

86,378.—BREECH LOADING FIREARM.—Julius Elson and W. R. Schaefer, Boston, Mass.

86,379.—APPARATUS FOR SAVING GOLD, AMALGAM, AND QUICKSILVER.—G. R. Evans (assignor to himself and John White), Virginia City, Nevada.

86,380.—MANUFACTURE OF TARRED PAPER, PASTEBOARD, ETC.—H. F. Evans, Beloit, Wis.

86,381.—STEAM ENGINE BALANCED VALVE.—Wm. Evered, Chicago, Ill.

86,382.—TREE PROTECTOR.—F. L. Faries, Wilkesbarre, Pa. Antedated Jan. 7, 1869.

86,383.—GATE POST.—Anthony Fishburn, Carlisle, Pa.

86,384.—HYDRANT.—Luke Fitton, Wheeling, West Va.

86,385.—KETTLE FOR BOILING MILK.—Herman Friedlander, New York city.

86,386.—CORN PLANTER.—Wm. C. Gardner, Pokagon, Mich.

86,387.—ANTI-RATTLER FOR CARRIAGES.—D. C. Gately, Newtown, Conn., assignor to New York Belting and Packing Company.

86,388.—APPARATUS FOR SAVING FLOATING GOLD.—David Gay, Jr., Vallejo, Cal.

86,389.—MORTISING MACHINE.—D. L. Gibbs (assignor to R. Ball and Company), Worcester, Mass.

86,390.—BOX FOR LOCOMOTIVE DRIVING-AXLES.—Joseph W. Goff, Providence, R. I.

86,391.—FRUIT MILL.—Edmund Greenlee, Rundells, Pa.

86,392.—BEARING FOR SHAFTS.—Jerome Haas, Stockton, Cal.

86,393.—STEAM GENERATOR.— Chas. H. Hall, Smith's Ferry, Pa.

86,394.—METALLIC REED FOR MUSICAL INSTRUMENTS.—A. H. Hammond, Worcester, Mass.

86,395.—TOWING CANAL-BOATS.—Chas. T. Harvey, Tarrytown, N. Y. Antedated Jan. 20, 1869.

86,396.—BURIAL CASE.—Jasper R. Hathaway, Westfield, N. Y.

86,397.—FRONT PLATFORM FOR CARRIAGES.—John Heiden, New York city.

86,398.—ADHESIVE COMPOUND AND PLASTER.—Jos. Hirsh, Chicago, Ill.

86,399.—STEP FOR SPINDLES.—Wm. P. Hopkins, Lawrence, Mass.

86,400.—POST-HOLE AUGER.—S. C. Horton, Tarrytown, N. Y.

86,401.—KNIFE FOR CUTTING AND CORING APPLES.—Charles D. House, Lake Village, N. H.

86,402.—SPOKING MACHINE.—Alex. Humphries, Bethel, Ohio. Antedated Jan. 20, 1869.

86,403.—BAG FASTENER.—Chas. J. Huntington, Rockford, Ill.

86,404.— MEDICAL COMPOUND.— S. W. Ingraham, M. D., Wooster, Ohio.

86,405.—VELOCIPEDE.—John H. Irwin, Philadelphia, Pa.

86,406.—VELOCIPEDE.—J. H. Irwin, Philadelphia, Pa.

86,407.—SAW.—Nicolas Jenkins, New York city. Antedated Jan. 18, 1869.

86,408.—SEEDING MACHINE.—W. F. Jessup, Shortsville, N. Y.

86,409.—MACHINE FOR WORKING WASTE FIBROUS STOCK.—A. W. Johnson, Worcester, Mass.

86,410.—GRAIN DISTRIBUTER.—George H. Johnson (assignor to himself Geo. W. Tift, Sons, and Company), Buffalo, N. Y.

86,411.—WATCH REGULATOR.—Florentine A. Jones, Boston, Mass.

86,412.—BELT PUNCH.—J. P. Jubb, Namaha, Mich.

86,413.—VENTILATOR.—Henry Kelley, Boston, Mass., assignor to himself, Walter J. Roberts, and Arthur C. Howard.

86,414.—COMPOUND FOR SOLDERING.—W. J. Kent (assignor to himself and L. W. Carr), Detroit, Mich.

86,415.—TOBACCO PRESS.—W. S. Kimball, Rochester, N. Y.

86,416.—RAILWAY-CAR TRUCK.—Jas. Kirkley and Hugh Gray, Chicago, Ill.

86,417.—BELT SHIPPING MECHANISM FOR LOOMS.— L. J. Knowles, Warren, Mass.

86,418.—BED-PLATE, BOLSTER-PLATE, AND LOCK-BRACKET FOR WAGONS.—H. C. Kochensperger Thornville, Ohio.

86,419.—SHADE AND AWNING.—L. C. F. Laesch, Philadelphia Pa. Antedated Jan. 22, 1869.

86,420.—PADLOCK.—Isaac W. Lamb, Salem, Mich.

86,421.—LUBRICATOR.—Fred. A. Leah (assignor to himself and L. S. Lane), Swanzey, N. H.

86,422.—CASTER, AND FRUIT AND CAKE DISH.—J. W. Larimore, Chicago, Ill. Antedated Jan. 22, 1869.

86,423.—BRICK MACHINE.—J. G. Lehr and H. D. Thorp, Harlan, Ind.

86,424.—KEY RING.—G. A. Libbey, Milwaukee, Wis., assignor to himself and Thomas Cogswell.

86,425.—STEAM GENERATOR.—Reuben Lighthall, Brooklyn, N. Y.

86,426.—METAL-FACED DIE FOR THE MANUFACTURE OF IMITATION STRAW GOODS.—Henry Loewenberg, New York city.

86,427.—KINDLING BLOCK.—W. Loft, Bergen, N. J.

86,428.—CULINARY BOILER.—S. P. Loomis, Philadelphia, Pa.

86,429.—STEAM GENERATOR.—C. Mason, Chicago, Ill.

86,430.—MILK AND BEER COOLER.—O. L. Mayhew (assignor to himself and J. Miller), Sanborn, N. Y.

86,431.—ROAD SCRAPER.—J. W. McDonald, Chicago, Ill.

86,432.—GLOBE VALVE FOR STEAM AND OTHER ENGINERY.—R. Mears, Dayton, Ohio.

86,433.—MODE OF PRESERVING FRUIT.—D. M. Mefford, Norwalk, Ohio.

86,434.—BREECH-LOADING FIREARM.—W. Morgenstern, New York city.

86,435.—STEAM GENERATOR.—J. S. Mullin, Newark, N. J.

86,436.—GRAIN DRYER.—J. J. Munger, Syracuse, N. Y.

86,437.—SHUTTER FASTENING.—G. W. Ouram, Philadelphia, Pa. Antedated January 16, 1869.

86,438.—TICKET PUNCH.—C. H. Palmer, New York, and T. K Leslie, Brooklyn, N. Y.

86,439.—ANCHOR.—G. C. Pattison (assignor to himself and B G. Harris), Baltimore, Md.

86,440.—SCHOOL DESK.—J. Peard, New York city.

86,441.—BEEHIVE.—J. Pearson, West Milton, Ohio.

86,442.—POTATO PLANTER, CULTIVATOR, AND DIGGER.—Chas. J. C. Petersen, Portchester, N. Y.

86,443.—APPARATUS FOR EVAPORATING BRINE AND OTHER LIQUIDS.—S. Platt, Goderich, Canada.

86,444.—HANDLE FOR TEAPOTS.—E. W. Porter (assignor to the Porter Britannia and Plate Company). Taunton, Mass.

86,445.—CARPET-RAG LOOPER.—G. L. Price, Clifton Springs, N. Y.

86,446.—BOTTLE STOPPER OR CAP.—J. Quinn and G. W Putnam, Boston, Mass.

86,447.—GLOBE VALVE FOR STEAM AND OTHER ENGINERY.—B. F. Radford, Hyde Park, and D. Sawyer, Boston, Mass.

86,448.—KNOB LATCH.—O. B. Rand, Kalamazoo, Mich.

86,449.—HARVESTER.—A. Rank and J. H. Cox, Salem, Ohio, assignors to A. Rank.

86,450.—MAKING HORSE-SHOE NAILS.—A. Reese, McClure Township, Pa.

86,451.—WAGON HUB.—N. Rixford, Mansfield Center, Conn.

86,452.—MACHINE FOR GRINDING CARDS.—J. Robb, Lawrence, Mass. Antedated January 20, 1869.

86,453.—MUCILAGE BOTTLE.—D. A. Robinson, Jr., Union Springs, N. Y.

86,454.—BOLT FOR STOVE DOORS, ETC.—W. Aspley Robinson, Auburn, N. Y.

86,455.—SHOEING DEVICE.—T. Rogers and D. Thompson, Fredericktown, Ohio.

86,456.—APPARATUS FOR HEATING METALS.—J. Roy, Boston, Mass. Antedated January 30, 1869.

86,457.—COMBINED SEED PLANTER AND PLOW.—E. Seibel, Wittenburg, Mo.

86,458.—COMBINED PLOW AND PLANTER.—M. Shackelford, Montgomery, Ala.

86,459.—CARRIAGE POLE.—G. N. Shaw, Muir, Mich.

86,460.—PLANING MACHINE.—J. B. Schenck, Matteawan, N. Y.

86,461.—PLANING MACHINE.—J. B. Schenck, Matteawan, N. Y.

86,462.—MACHINE FOR SERRATING SICKLE SECTIONS.—S. D. Sheldon, Fitchburg, Mass.

86,463.—TABLE CASTER.—D. Sherwood (assignor to Woods, Sheerwood & Co.), Lowell, Mass.

86,464.—STEAM GENERATOR.—O. P. Shiras, New Castle, Pa.

86,465.—DEVICE FOR REGULATING THE TENSION ON THE WARP IN LOOMS.—M. Sigler, Paterson, N. J.

86,466.—HYDRANT.—J. J. Smith and S. Wood, Cleveland, Ohio.

86,467.—HARDENING DIES.—E. W. Sperry, Wolcottville, Conn.

85,468.—STAVE-DRESSING MACHINE.—P. Stricker and James Lefeber, Cambridge City, Ind.

86,469.—BLOWER.—B. F. Sturtevant, Boston, Mass.

86,470.—ROTARY BLOWER.—B. F. Sturtevant, Boston, Mass.

86,471.—MEDICATED BEVERAGE.—W. W. Timmons, Rahway, N. J. Antedated January 29, 1869.

86,473.—GANG PLOW.—J. Totten, Adams, Ill.

86,473.—MACHINE FOR MAKING BUTTON HOOKS.—Lauriston Towne (assignor to "Lacing Button Hook Company"), Providence, R. I.

86,474.—GUIDE FOR SEWING MACHINES.—Wm. H. Van Vlear (assignor to himself and W. E. Green), Stockton, Cal. Antedated January 22, 1869.

86,475.—BOOT AND SHOE STRETCHER.—P. Veitch, San Francisco, Cal.

86,476.—FENCE POST.—G. Webb, Lewiston, Me.

86,477.—MACHINE FOR DISTRIBUTING FERTILIZERS.—W. F. Weirick, John C. Weller, and D. E. Rohr, Charlestown, W. Va.

86,478.—ROTARY HARROW.—B. A. Welds, M. H. Welds, and H. W. Strong, Reading, Mich.

86,479.—PARLOR GAME.—H. M. White, East Hartford, Conn.

86,480.—STEAM HEATER.—C. Whittier (assignor to himself and B. F. Campbell), Boston, Mass. Antedated November 10, 1868.

86,481.—STEAM HEATER.—C. Whittier (assignor to himself and B. F. Campbell), Boston, Mass. Antedated November 10, 1868.

86,482.—DOOR SPRING.—F. S. Wilcox, Bridgeport, Conn.

86,483.—SHUTTLE FOR LOOMS.—N. A. Williams, Utica, N. Y.

86,484.—COFFEE-MILL FASTENER.—J. Winkler, Hudson City, N. J.

86,485.—SHEEP RACK.—M. S. Woodbury, Bethel, Vt.

86,486.—SLEEPING CAR.—T. T. Woodruff, Philadelphia, Pa.

86,487.—SLED BRAKE.—A. W. Wright, Calvin, Pa. Antedated January 30, 1869.

86,488.—CULINARY BOILER.—E. K. Ames, Chicago, Ill.

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86,489.—Lubricating Journal Boxes.—E. A. Atwood and H. H. Bodwell, San Francisco, Cal. Antedated January 25, 1869.
86,490.—Boat Detaching Apparatus.—J. Atwood, Jr., and T. M. Hatch, Provincetown, Mass.
86,491.—Three-Horse Equalizer.—E. F. Avery and H. B. Leckenby, Dowagiac, Mich.
86,492.—Safety Strip for Packing Cases.—S. Baker, Newark, N. J.
86,493.—Construction of Burglar-Proof Safes.—R. A. Ballou, Boston, Mass.
86,494.—Lacing for Boots.—W. Banister, Boston, Mass.
86,495.—Velocipede.—J. Beck, New York city.
86,496.—Tenoning Machine.—J. Behel and J. Nelson, Rockford, Ill.
86,497.—Machine for Making Cord.—Harris Boardman, Lancaster, Pa.
86,498.—Faucet.—D. L. Bollermann and R. Bollerman, New York city.
86,499.—Cooking Stove.—N. A. Boynton, New York city.
86,500.—Handle for Cans, etc.—M. Bray, Boston, Mass.
86,501.—Buckle.—G. A. Brown, Kalamazoo, Mich.
86,502.—Cultivator.—R. I. Burbank, Boston, Mass.
86,503.—Blank or Bar for Toe Calks.—P. F. Burke, Worcester, Mass.
86,504.—Metal and Rubber Tires Combined.—John H. Cheever, New York city.
86,505.—Poker and Lid-lifter Combined.—William Clegg, Philadelphia, Pa.
86,506.—Mode of Tawing Skins of Animals.—Louis Clozel, Grenoble, France.
86,507.—Whip Socket.—George P. Cole, Hudson, Mich.
86,508.—Hose Protector.—Charles Crozat Converse, Brooklyn, N. Y.
86,509.—Potato Digger.—John W. Corwin, Lebanon, Ohio.
86,510.—Felted Fabric.—Thomas Crossley, Bridgeport, Conn.
86,511.—Harvester Rake.—J. D. Custer, Norristown, Pa.
86,512.—Door Mat.—Jacob J. Diehl, Idaville, Pa.
86,513.—Process for Desulphurizing Ores to Obtain the Precious Metals.—Henry H. Eames, St. Paul, Minn.
86,514.—Desulphurizing and Treating Ores for the Extraction of Precious Metals.—Henry H. Eames, St. Paul, Minn.
86,515.—Feed Water Heater for Steam Generators.—Richard Eaton, Eaton Lodge, Kentish Town, England.
86,516.—Hay Spreader.—W. H. Elliot, New York city.
86,517.—Head Block.—Charles R. Ely, Northfield, Vt.
86,518.—Mill Staff.—A. Eshelman, Earlville, Pa.
86,519.—Ice-Cream Mold.—Peter Fild, Boston, Mass.
86,520.—Breech-loading Fire-arm. — Valentine Fogerty, Boston, Mass.
86,521.—Shield for Corn in Plowing.—John Fox, Homer, Ind.
86,522.—Tea and Coffee Pot.—Theodore F. Frank, Buffalo, N. Y.
86,523.—Mowing Machine.—Am. Franklin, W. J. Hastings, and Abner Gates, Florence, Ind.
86,524.—But.—James D. Frary, New Britain, Conn.
86,525.—Sleigh and Wheeled Vehicle.—David C. Frazeur, Siddonsburg, Pa.
86,526.—Wash Boiler.—Peter Frentz, New Albany, Ind.
86,527.—Ice Shaver.—Robert Gilliland, Hudson, Mich.
86,528.—Bee House.—David S. Gray (assignor to himself and Moses H. Masser), Onarga, Ill. Antedated January 20, 1869.
86,529.—Gas-producing Apparatus for Use in Metallurgy, Glass-making, and for Other Purposes.—Jacob Green, Norristown, Pa.
86,530.—Artificial Limb.—S. G. Gregory, Albany, N. Y.
86,531.—Low-Water Indicator for Boilers.—James S. Griffith, St. Louis, Mo.
86,532.—Press for Baling Cotton.—Benjamin D. Gullett, Amite City, La.
86,533.—Horse Power Connection.—John A. Hafner, Commerce, Mo.
86,534.—Screw Wrench.—Charles Hall, New York city.
86,535.—Distilling Hydrocarbon Oils.—Charles H. Hall, Smith's Ferry, Pa.
86,536.—Method of Converting Cast Iron into Sfeel.—Alexander Hamar, Philadelphia, Pa.
86,537.—Converting Cast Iron into Malleable Iron.—Alexander Hamar, Philadelphia, Pa., and George H. Sellers, Wilmington, Del.
86,538.—Girder for Bridges.—David Hammond and W. R. Reeves, Canton, Ohio.
86,539.—Abdominal Supporter.—Mrs. E. J. Harding, St. Louis, Mo.
86,540.—Oil Cup of Connecting Rods or Movable Bearings of Machinery.—Dennis Harrigan, Somerville, assignor to himself and John H. Wiggins, Boston, Mass.
86,541.—Cigar Machine.—I. A. Heald, Washington, D. C.
86,542.—Carpet Bag Frame.—Franz Herman (assignor to himself and E. A. G. Roulstone, assignors to Albert Sonnekalb and John W. Lieb) Newark, N. J.
86,543.—Railway Axle Box.—Aaron Higley, South Bend, Ind.
86,544.—Box for Hair Pins.—Joseph C. Howells, New York city.
86,445.—Velocipede.—E. N. Huntsman, Allegheny, Pa.
86,546.—Composition for Mortar, Cement, Paint, etc.—Carleton B. Hutchins, Ann Arbor, Mich.
86,547.—Rendering Safes and other Structures Fireproof, and Protecting the same against Corrosion.—Thaddeus Hyatt, Atchison, Kansas.
86,548.—Lantern.—John H. Irwin, Chicago, Ill.
86,549.—Lantern.—John H. Irwin, Chicago, Ill.
86,550.—Tobacco Box.—John P. Jamison, New York city.
86,551.—Tonic Bitters.—R. P. Jenkins, Nashville, Tenn.
86,552.—Blind Fastener.—Job Johnson and Simon Ingersoll, Brooklyn, N. Y., assignors to Job Johnson.
86,553.—Mode of Collecting the Exudable Products of Pine Trees.—John Johnson, Saco, Me. Antedated January 30, 1869.
86,554.—Harvester Rake.—Samuel Johnston, Syracuse, N. Y.
86,555.—Washing Machine.—John J. Koch, Republic, Ohio.
86,556.—Water Wheel.—Dennis Lane, Montpelier, Vt.
86,557.—Brick Machine.—W. O. Leslie, Philadelphia, Pa.
86,558.—Axle Box and Hub.—Gabriel Leverich, Elizabethport, N. J.
86,559.—Seed Sower.—James L. Linderman, Rockford, Ill.
86,560.—Lock for Express Bags, etc.—Edward A. Locke and William B. Mason, Boston, Mass.
86,561.—Seed Sower.—M. F. Lowth and T. J. Howe, Owatonna, Minn.
86,562.—Corn Sheller.—W. J. Ludlow, Cleveland, Ohio.
86,563.—Hand Seed Sower.—Jasper N. Matlock, Augusta, assignor to himself, William Blair, and Edward D. Ingersoll, Des Moines, Iowa.
86,564.—Elevator and Table for Feeding Grain Separators.—Don Carlos Matteson and Truman Pane Williamson, Stockton, Cal.
86,565.—Horse Hay Fork.—Don Carlos Matteson and Truman Pane Williamson, Stockton, Cal.
86,566.—Breech-loading Firearm. — Edward Maynard, Washington, D. C.
86,567.—Brick Machine.—G. W. McCann, Springfield, Ohio.
86,568.—Wash Boiler.—S. A. McGeorge, Almont, Mich.
86,569.—Beehive.—J. D. Meador, Independence, Mo.
86,570.—Corset.—E. J. Meriman, New York city.
86,571.—Sheet Metal Can.—H. Miller, New York city.
86,572.—Portable Sectional House.—J. Montgomery, New York city.
86,573.—Velocipede.—J. A. Morrell, New York city.
86,574.—Prepared Phosphate.—O. A. Moses, Charleston, S. C.
86,575.—Paper-Feeding Machine.—W. Mowry, Minneapolis, Minn.
86,576.—Device for Splitting Match Splints.—M. D Murphy and O. C. Barber (assignor to the "Barber Match Company") Middlebury, Ohio.
86,577.—Combined Single and Double-Shovel Plow.—J. W. Nicholson, Indianapolis, Ind.
86,578.—Cooking Stove.—C. Olhaber, Cincinnati, Ohio.
86,579.—Chill for Casting Mold Boards.—J. Oliver, South Bend, Ind.
86,580.—Feed-Water Device for Boilers.—J. D. Otis, Peoria, Ill.
86,581.—Shaft Coupling.—E. E. Packer and C. T. Packer, (assignors to themselves and J. E. Packer), Philadelphia, Pa.
86,582.—Lock Nut.—G. Palmer, Littlestown, Pa.
86,583.—Railway Track.—G. Palmer, Littlestown, Pa.
86,584.—Harvester.—J. G. Perry, Kingston, R. I.
86,585.—Reservoir Cooking Stove.—G. H. Phillips, Troy, N. Y.
86,586.—Girdle for Paint Brushes.—A. M. Piper and O. Allen, Springfield, Mass.
86,587.—Halter Hitch.—G. Race, Norwich, N. Y.
86,588.—Shear Boom.—C. Randall, J. F. Moore, and J. Randall, West Eau Claire, Wis., administrators of the estate of A. Randall, deceased.
86,589.—Corn Planter.—J. R. Randall, Camargo, Ill.
86,590.—Machine for Uniting the Soles and Uppers of Boots and Shoes.—T. K. Reed, East Bridgewater, Mass.
86,591.—Stitch Fastening Wire.—T. K. Reed, East Bridgewater, Mass.
86,592.—Process of, and Mechanism for Forming Stitched Seams.—T. K. Reed, East Bridgewater, Mass.
86,593.—Ten-Pin Alley.—C. Robinson, Boston, Mass.
86,594.—Gage for Sewing Machines.—Peter Rodier, Detroit, Mich.
86,595.—Corn Planter.—W. H. Sabins, Rockford, Ill.
86,596.—Process of Making Shot.—E. Shiver, Columbia, S. C.
86,597.—Wrench.—W. H. Sible, Harrisburgh, Pa.
86,598.—Swing.—G. Sill, Wilkins, assignor to himself and H. H. Negley, Eltsburg, Pa.
86,599.—Adjustable Mirror and Stand.—H. W. Southworth, Mittineague, Mass.
86,600.—Fire Escape.—O. Spear, Baltimore, Md.
86,601.—Gate Latch.—J. W. Still, San Francisco, Cal.
86,602.—Harvester Dropper.—J. O. Taber, Salem, Ohio.
86,603.—Farm Gate.—J. Tanner, Hebron, Ky.
86,604.—Medical Vibrating and Kneading Machine.—G. H. Taylor, New York city.
86,605.—Molding Machine.—I. P. Tice, New York city, assignor to A. S. and J. Gear and Company, New Haven, Conn.
86,606.—Tobacco Box.—C. Tolnor, Jr., New York city.
86,607.—Machine for Sawing Staves.—J. W. Trout, Arcola, Ill.
86,608.—Gang Plow.—J. Tustin, Portland, Oregon.
86,609.—Float for Anglers.—J. A. Terrell, Bloomfield, Ky., assignor to himself and C. A. Terrell.
86,610.—Constructing Slate Frames.—W. P. Uhlinger and Justus Doring, Philadelphia, Pa.
86,611.—Machine for Cutting up Leather Stock, etc.—F. L. Walker, Boston, Mass.
86,612.—Pump.—S. B. Ward, Drummondtown, Va.
86,613.—Brake Block for Railway Cars.—W. Wilmore, Scranton, Pa.
86,614.—Dumping Scow.—H. W. Wilson, Boston, Mass.
86,615.—Plow.—G. A. Wing, Albany, N. Y.
86,616.—Stove Grate.—G. A. Wing, Albany, N. Y.
86,617.—Stop Valve for Steam Generators.—G. W. Wiswell, Pilot Knob, Mo.
86,618.—Combined Wheelbarrow Fanning Machine.—J. Womeldorff, Warsaw, Ind.
86,619.—Ox Cart.—M. S. Woodbury, Bethel, Vt.
86,620.—Smoke-Burning Furnace.—F. A. Woodson, Anna, Ill.
86,621.—Pedal for Pianos, etc.—E. Zachariae, Loehnberg, near Weilburg, Prussia.
86,622.—Ventilator.—G. J. Zimmerman, Baltimore, Md.

REISSUES.

36,776.—Machine for Tramming, Staffing, and Fine Dressing of Millstones.—Dated October 28, 1862; reissue 3,279.—L. Anderson (assignee of J. T. Gilmore), Painesville, Ohio.
80,905.—Pump.—Dated August 11, 1868; reissue 3,280.—John Brokenshire, Oswego, N. Y.
41,916.—Sewing Machine.—Dated March 15, 1864; antedated March 9, 1864; reissue 3,281.—W. S. Guinness, London, England, for himself and A. G. Seaman, New York city, assignee of W. S. Guinness.
59,342.—Method of Treating Cork for the Manufacture of Mattresses, etc.—Dated November 6, 1866; reissue 3,282.—A.—H. Hauer, Philadelphia, Pa., administrator of the estate of L. Bauhoefer.
59,342.—Prepared Cork for the Manufacture of Mattresses, etc.—Dated November 6, 1866; reissue 3,283.—B.—Henry Hauer, Philadelphia, Pa., administrator of the estate of L. Bauhoefer.
29,640.—Harvester Rake.—Dated August 14, 1860; reissue 3,284.—A. J. Holman, Philadelphia, Pa., assignee, by mesne assignments, of I. C. Twining.
81,281.—Bustle.—Dated August 18, 1868; reissue 3,285.—J. B. Loomis, Chelsea, Mass.
57,826.—Portable Railway.—Dated September 4, 1866; reissue 3,286.—A. Peteler, New Brighton, N. Y., assignee of J. N. Peteler.

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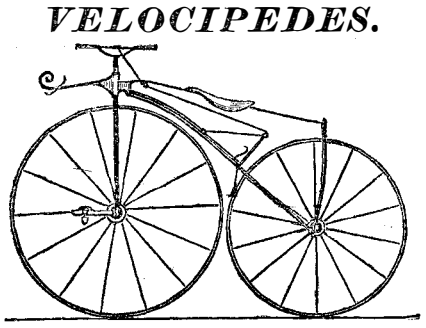
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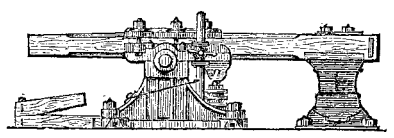
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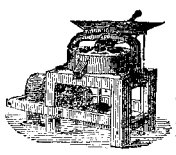
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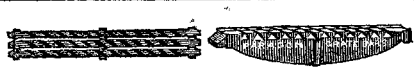
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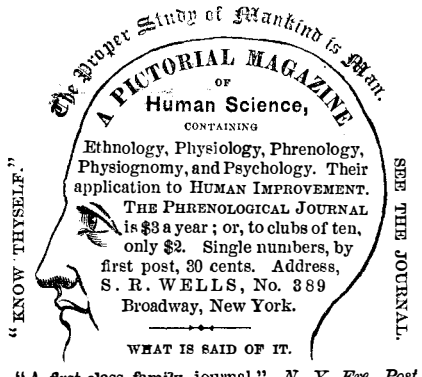
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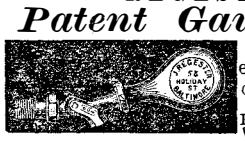
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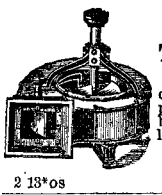

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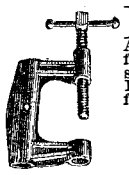

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